FLOOD PLAIN INFORMATION

TAR RIVER
AND
STONY CREEK

ROCKY MOUNT
NORTH CAROLINA

PREPARED FOR
THE CITY OF ROCKY MOUNT
BY
CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

AUGUST, 1968

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INTRODUCTION

This report relates to the flood situation along Tar River and Stony Creek in the vicinity of Rocky Mount, North Carolina. It was prepared at the request of the City Council of the City of Rocky Mount through the North Carolina Department of Water and Air Resources, to aid in the solution of local flood problems and in the best utilization of land subject to overflow. The report is based upon information on rainfall, runoff, historical and current flood heights, and other technical data bearing upon the occurrence and size of floods in the Rocky Mount area.

The report covers two significant phases of the flood problem at Rocky Mount. It first brings together a record of the largest known floods of the past on Tar River and Stony Creek. Secondly, it describes the estimated effects of probable future floods of two magnitudes: namely, Intermediate Regional Floods and Standard Project Floods. Intermediate Regional Floods are floods that have an average frequency of occurrence in the order of once in 100 years, and are determined from an analysis of known floods on Tar River and other streams which have similar physical characteristics and are in the same general geographical region. Standard Project Floods are floods of rare occurrence and, on most streams, are considerably larger than any floods that have occurred in the past. However, they should be considered in planning for use of the flood plains.

In problems concerned with the control of developments in the flood plains of Tar River and Stony Creek, and in reaching decisions on the size of floods to consider for this purpose, appropriate consideration should be given to the possible future occurrence of floods of the size of those that have occurred in the past, the Intermediate Regional Floods and the Standard Project Floods.

The report contains photomaps, profiles, and cross sections which indicate the extent of flooding that has been experienced and that which might occur in the future in the vicinity of Rocky Mount.

This should prove helpful in planning the best use of the flood plains. From the photomaps, profiles, and cross sections, the depth of probable flooding either by recurrence of the largest known floods or by occurrence of the Intermediate Regional or Standard Project Floods at any location may be learned. With this information, floor levels of buildings may be planned high enough to avoid flood damage or, if at lower elevations, with recognition of the chance and hazards of flooding that are being taken.

The report does not include plans for the solution of flood problems. Rather, it is intended to provide the basis for further study and planning by the City of Rocky Mount in arriving at solutions to minimize vulnerability to flood damages. This might involve local planning programs to guide developments by controlling the type of use made of the flood plain through zoning and subdivision regulations, the construction of flood-protection works, or a combination of the two approaches.

The Wilmington District of the Corps of Engineers will, upon request, provide technical assistance to Federal, State, and local agencies in the interpretation and use of the information contained herein, and will provide other available flood data related thereto.

SUMMARY OF FLOOD SITUATION

The City of Rocky Mount is located on the Tar River and near the middle of the Tar River Basin. Although the city lies on both sides of the river, the major portion of the city lies south and east of the river. Stony Creek approaches the city from the northwest and empties into Tar River at a point about midway between the U. S. Highway 64 and N. C. Highway 43 bridges over the river. As shown on plate 1, this report covers the Tar River from Mile 79 to Mile 91, and Stony Creek from its mouth to Mile 5.6.

Most of the residential and commercial property in Rocky Mount is located on high ground not subject to flooding. However, there are many residential and commercial developments located on the flood plains. About 21 percent of the area within the city limits of Rocky Mount is subject to flooding which could effect more than 500 houses and buildings, many miles of streets, utilities, etc.

The U. S. Weather Bureau, an agency of the Environmental Science Services Administration, has maintained a stream gaging station on Tar River at Rocky Mount since July 1910. Also, about 5 miles downstream from the Weather Bureau gage, the U. S. Geological Survey has installed and maintained a stream gage since November 1963. There is no stream gage on Stony Creek. Residents along the streams have been interviewed and newspaper files and historical documents have been searched for additional information concerning past floods. From these investigations, stream gage records, and studies of possible future floods on Tar River and Stony Creek at Rocky Mount, the local flood situation, both past and future, has been developed.

The following paragraphs summarize the significant findings which are discussed in more detail in succeeding sections of this report.

* * *

THE GREATEST FLOOD of record on Tar River at Rocky Mount occurred in July of 1919. U. S. Weather Bureau records indicate that the flood

stages reached by this flood exceeded those reached by any other recorded event. There is some indication, based on data of unknown reliability, that flood stages some 3.5 feet higher than the 1919 event may have occurred at Rocky Mount in 1908.

The greatest flood stage for which high-water marks were obtained on Stony Creek occurred at an unknown time, but probably during the last 50-year period. This flood was approximately 2 feet lower than the Intermediate Regional Flood at State Road 1613. The August 1955 flood was approximately 3.5 feet lower than the Intermediate Regional Flood at the same location.

* * *

ANOTHER GREAT FLOOD occurred in October 1924. This flood was about 0.5 foot lower than the 1919 event at the site of the Rocky Mount gage on Tar River.

* * *

OTHER LARGE FLOODS on Tar River at Rocky Mount occurred in September 1928, December 1934, and September 1945. The 1928, 1934, and 1945 floods were from 1.3 feet to 1.5 feet lower than the 1924 flood.

* * *

INTERMEDIATE REGIONAL FLOODS on Tar River and Stony Creek are floods that have an average frequency of occurrence in the order of once in 100 years. They are determined from an analysis of floods on these streams and other streams in the same general area. The analysis indicates that the Intermediate Regional Flood for Tar River at Rocky Mount is 4.5 feet higher than the September 1945 flood, and for Stony Creek is 9 feet higher than the bankfull stage.

* * *

STANDARD PROJECT FLOOD determinations indicate that floods could occur on Tar River in the Rocky Mount area about 12 feet higher than the 1945 flood, or 8 feet higher than the Intermediate Regional flood. On Stony Creek, these floods could range from 4 to 11 feet higher than the Intermediate Regional Floods.

* * *

FLOOD DAMAGES that would result from recurrences of major known floods would be substantial. Considerably greater damage would be caused by the Intermediate Regional and Standard Project Floods because of their wider extent, greater depths, and higher velocities.

* * *

MAIN FLOOD SEASONS for the Rocky Mount area are the two periods of January through April, and July through October. However, most of the higher floods occur during the hurricane season from July through October.

* * *

VELOCITIES OF WATER during major floods range up to 7 feet per second (about 5 miles per hour) in the channel of the Tar River. Velocities on the flood plain vary widely, depending upon location, but generally are less than 2 feet per second. During the Standard Project Flood, floodflow velocities would be dangerous to life and property. In the Tar River channel, such velocities would range up to 9 feet per second; and, in the Stony Creek channel, the velocities would range up to 8 feet per second. Floodwater velocities over the flood plains would be considerably less, ranging up to 2 feet per second along Tar River, and 1 foot per second along Stony Creek. Velocities greater than 3 feet per second combined with depths of 3 feet or greater are generally considered hazardous.

* * *

DURATION OF FLOODS is 4 to 6 days for Tar River and Stony Creek in the vicinity of Rocky Mount. Stages rise from normal levels to extreme flood peaks in about 100 hours following intense rainfall periods. During the flood of September 1945, the Tar River had a maximum rate of rise of about 0.1 foot per hour and remained out of banks for about 146 hours. During a Standard Project Flood on Tar River, the stream would rise about 19 feet in about 55 hours and would remain out of its banks for about 92 hours.

* * *

HAZARDOUS CONDITIONS would occur during large floods as a result of the rapidly rising streams, high velocities, and deep flows.

* * *

FLOOD-DAMAGE-PREVENTION MEASURES. There are no existing or authorized flood control or related measures in the study area or upstream in the watershed. A basin-wide, water-resource-development study is currently being conducted by the Corps of Engineers. This study, which is scheduled for completion in 1968, may result in the provision of a project or projects designed to reduce flood stages throughout the Tar River Basin. Until this study is completed, no determination of the effects at Rocky Mount of any proposed project can be made. At the present time, there are no flood-plain regulations in Rocky Mount.

* * *

FUTURE FLOOD HEIGHTS that would be reached if the Intermediate Regional and Standard Project Floods occurred in the vicinity of Rocky Mount are shown in table 1. The table gives the comparison of these flood crests and also compares these floods with the September 1945 flood and August 1955 flood for Tar River and Stony Creek, respectively.

TABLE 1

RELATIVE FLOOD HEIGHTS

Tar River

Flood	Location	River mile	Estimated peak discharge cfs	Above 1945 flood feet
September 1945	Highway 64 (USWB gage)	85.38	16,200	0
Intermediate Regional			26,500	5.0
Standard Project			58,570	11.4

TABLE 1--Continued

RELATIVE FLOOD HEIGHTS

Stony Creek

Flood	Location	Creek mile	Estimated peak discharge cfs	Above 1955 flood feet
August 1955	State Road 1613 (Downstream side)	2.85	4,100	0
Intermediate Regional			8,300	3.5
Standard Project			25,260	9.5

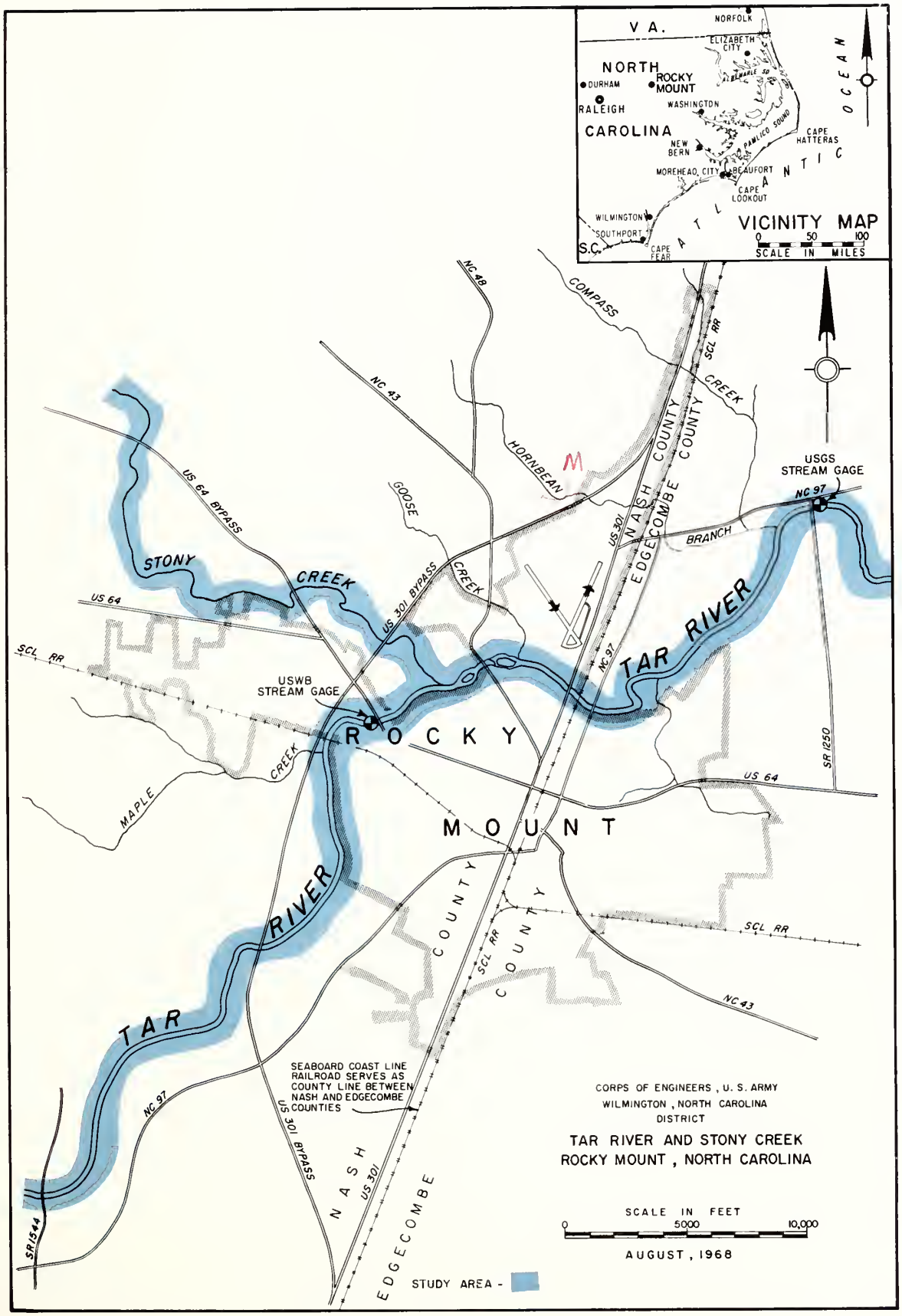

VICINITY MAP
V A.
NORFOLK
ELIZABETH CITY
NORTH CAROLINA
ROCKY MOUNT
DURHAM
RALEIGH
WASHINGTON
ALBEMARLE SD
PAMLICO SOUND
CAPE HATTERAS
NEW BERN
MOREHEAD CITY
BEAUFORT
CAPE LOOKOUT
WILMINGTON
SOUTHPORT
CAPE FEAR
S.C.
OCEAN
ATLANTIC
0 50 100
SCALE IN MILES
NC 48
NC 43
COMPASS
SCL RR
CREEK
HORNBEAN
GOOSE
US 64 BYPASS
STONY
CREEK
US 64
US 301 BYPASS
US 301
NASH COUNTY
EDGECOMBE COUNTY
BRANCH
NC 97
USGS STREAM GAGE
TAR RIVER
USWB STREAM GAGE
ROCKY
MOUNT
MAPLE
SR 1250
SEABOARD COAST LINE RAILROAD SERVES AS COUNTY LINE BETWEEN NASH AND EDGECOMBE COUNTIES
SR 1544
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA
DISTRICT
TAR RIVER AND STONY CREEK
ROCKY MOUNT, NORTH CAROLINA
SCALE IN FEET
0 5000 10,000
AUGUST, 1968
STUDY AREA -

PLATE I

GENERAL CONDITIONS AND PAST FLOODS

GENERAL

This section of the report is a general discussion of the flood situation on Tar River and Stony Creek in the vicinity of Rocky Mount in Edgecombe and Nash Counties, North Carolina. Rocky Mount is located on the Tar River about 84 miles upstream from Washington, N. C., where the river enters the coastal estuary known as the Pamlico River. The portion of the Tar River studied extends from Mile 79.0 upstream through the City of Rocky Mount to Lemons Bridge at Mile 90.78, a distance of 11.8 miles. The drainage area of Tar River above the lower limits of this study area is approximately 937 square miles. The drainage area of the entire Tar River Basin is 3,081 square miles. The portion of Stony Creek studied extends from its mouth upstream to Mile 5.6. The drainage area of Stony Creek is about 116 square miles.

The Tar River flows in a northeasterly course through the reach covered in this report, and Stony Creek flows in a southeasterly course. The confluence of the two streams occurs in the northwestern part of Rocky Mount.

The first records of river stages on Tar River in the vicinity of Rocky Mount date from July 1910, when the U. S. Weather Bureau installed a stream gage. Since November 1963, the U. S. Geological Survey has maintained a wire-weight stream gage located about 5 miles downstream from the Weather Bureau gage. There is no stream-gaging station on Stony Creek.

Flood history searches developed information on Tar River and Stony Creek in the vicinity of Rocky Mount. Local residents were interviewed and field investigations and office computations were made to supplement the early data and to develop the flood profiles for the major floods that are known to have occurred in the reaches under study. A search was also made of newspaper files and historical documents. From these sources, and gage records, it has been possible to develop a history of the known floods on Tar River in the vicinity of Rocky Mount covering the past 60 years. Only a partial history of

floods on Stony Creek was developed since very little information was available concerning past floods.

This section of the report also discusses separately the flood history of both streams.

Settlement

Although settlement in the Falls area of the Tar River is recorded as early as 1733, it was not until 1816, upon the inauguration of a post office, that the community became known as Rocky Mount. The name was derived from the few acres of rocky mounds on the north side of the Falls. The city was incorporated in 1867 and 40 years later granted city status.

Rocky Mount is located in two counties, Nash and Edgecombe, and the county line runs along the Seaboard Coast Line Railroad through the center of the city so that nearly half of the city lies in each county.

Throughout its history, Rocky Mount's economic development has centered around cotton, tobacco, and railroads; the cotton industry and the tobacco markets being backed up by the surrounding rich and productive farmland. A large cotton mill, the second established in North Carolina, opened in 1818, and is still operating. Nash and Edgecombe are two of the five counties which account for well over one-fourth of North Carolina's cotton. Both Nash and Edgecombe Counties are major producers of tobacco, Nash being one of the five leading counties in the State.

Railroads reached Rocky Mount in 1840, bringing ready access to markets as well as prosperity to businesses furnishing facilities and services for travelers. The changing of train crews in Rocky Mount, a relay center for railroads since 1874, has provided jobs for many residents and has boosted considerably the economy of Rocky Mount.

Trade and industry continue to grow in Rocky Mount. In 1963, Rocky Mount had 56 manufacturing establishments employing 4,040

persons, as well as 461 retail and 103 wholesale trade establishments. Rocky Mount is also the home of North Carolina Wesleyan College.

The 1960 Census gives the population of Rocky Mount as 32,147. The city's population increased 16.1 percent from 1950 to 1960. The population of the city is currently estimated to be about 37,500, indicating a continuation of the above-mentioned growth rate.

Flood-Damage-Prevention Measures

There are no existing or authorized flood control or related measures in, or upstream from, the study area. The Corps of Engineers is currently conducting a basin-wide, water-resource-development study of the Tar River Basin. This study, which is scheduled for completion in 1968, may result in the provision of a project or projects designed to reduce flood stages throughout the basin. The effects of such projects, if any, in the Rocky Mount area cannot be determined until the study currently underway is completed. The City of Rocky Mount has no flood plain regulations in effect at this time.

Flood-Warning and Forecasting Services

Rocky Mount does not receive specific flood warnings or forecasting services from the Environmental Science Services Administration - Weather Bureau at the present time. General weather forecasts of intense rainfall, with accompanying flash-flood warnings, are issued by an office of the above-mentioned agency located at the Raleigh-Durham Airport.

TAR RIVER

The Stream and Its Valley

Tar River rises in Granville and Person Counties, North Carolina, and flows generally in a southeasterly course for a distance of about 190 miles to its mouth at Washington, N. C. The basin is oblong in shape with its long axis oriented in a northwest-southeast

direction, and has a maximum width of about 42 miles near its center. The river drains 3,081 square miles covering all or parts of 12 counties in northeastern North Carolina. The total fall of the river from its headwaters to its mouth is nearly 600 feet with an average fall of about 3 feet per mile. The upper half of the Tar River Basin lies in the Piedmont section and is generally hilly with narrow flood plains, while the lower half of the basin is in the broad coastal plain of North Carolina where the land generally flattens and flood plains are wide.

Rocky Mount is located near the middle of the basin at what is known as the Fall Line or Fall Zone which separates the Piedmont and Coastal Plain areas of the State. The length of river reach covered in this study is approximately 12 miles, beginning at Lemons Bridge (River Mile 90.78) passing through the City of Rocky Mount and ending at Mile 79.0. The total fall of the river through the study reach is about 40 feet with an average fall of about 3 feet per mile. However, the streambed slopes are considerably flatter through the study area than indicated above, since the Fall Zone crosses the Tar River and its flood plain at Mile 84. A natural stream fall occurs at this point; and, although the fall is not abrupt, the streambed drops 10 feet vertically in about 1,000 feet. This natural fall, together with the construction of various type dams at the upper end of the falls, has been used for nearly 150 years for various purposes. The present masonry dam was constructed near the turn of the century by the Rocky Mount Mills. Streamflow impounded by the dam is currently used for hydropower production and as a water-supply source for the City of Rocky Mount.

The dam has an average height of about 10 feet. Normal discharges are controlled by two slide gates mounted in a reinforced concrete structure on the right side of the dam, and higher flows are discharged over the dam throughout its entire length. The dam, together with the natural falls, accounts for about one-half or 20 feet of the total fall of the river through the study reach.

The flood plain of the Tar River varies from 900 to 13,000 feet in width through the study area. Approximately 21 percent (or 1,700 acres) of area within the city limits of Rocky Mount is subject to flooding during extreme floods. The river forms the western and northern corporate limits of Rocky Mount for much of the distance between Mile 83 and Mile 87 in the study reach. Pertinent drainage areas of Tar River are given in table 2.

TABLE 2

DRAINAGE AREAS IN WATERSHED OF TAR RIVER

(Rocky Mount Vicinity)

Stream	Location	Miles Above Mouth	Drainage Area sq. mi.
Tar River	Lower limit of study area	79.0	937
	USGS stream gage (S.R. 1250 Bridge)	80.4	933
	Above Compass Creek	80.7	916
	Above Stony Creek	84.71	804
	USWB stream gage (U.S. Highway 64 Bridge)	85.4	803
	Above Maple Swamp	86.02	784
	Lemons Bridge (S.R. 1544) (Upper limit of study)	90.8	777
Compass Creek	Mouth		16
Maple Swamp	Mouth		12
Stony Creek	Mouth		112

Developments in the Flood Plain

Plate 5 is an index map of the six sheets that show flooded areas of Tar River and Stony Creek near Rocky Mount. Plates 6 through 10 show the flood plain of Tar River for the reach covered by this report. Except for developments within the City of Rocky Mount and minor developments along U. S. Highway 301 Bypass west of the city, there are only scattered developments elsewhere. A large part of the flood plain is devoted to agricultural or related purposes.

A main line of the Seaboard Coast Line Railroad Company crosses the valley from north to south, and the river at Mile 83.27. In addition, a branch line going west through Bunn, N. C., crosses the river at Mile 85.93. In both cases, the tracks in the study area are well above past floods and the Intermediate Regional Flood, but are subject to inundation by the Standard Project Flood.

There are eight highway bridge crossings in the reach of Tar River studied. The newest bridge at the Atlantic Avenue crossing is the only bridge that would not be overtopped by the Standard Project Flood. The approach fills at this site, however, would be inundated. Although the Intermediate Regional Flood would top the underclearance at six of the 10 bridge crossings, none of the bridge decks would be overtopped. At S.R. 1250, the roadway south of the bridge would be flooded by the Intermediate Regional Flood, as would the roadways to the west at U. S. Highway 64 bridge and at Nashville Road bridge.

Development of the Tar River flood plain is taking place at varying rates throughout the reach length studied. Very few structural developments have been made at the upper and lower limits of the study area, but in the city limits of Rocky Mount considerable developments exist. Industrial and commercial development is rapidly taking place in the strip of land between the business route of U. S. Highway 301 and the Seaboard Coast Line Railroad in the northern portion of the city. While much of this area is not subject to flooding by the Intermediate Regional Flood, the area would be inundated to a depth ranging from 7 to 12 feet by the Standard Project Flood.

Some of the major existing developments in the Tar River flood plain include the Rocky Mount Power, Gas, and Water Company, city owned utilities located near the U. S. Highway 64 bridge; Rocky Mount Mills, located at Mile 84.2 near the dam; the Rocky Mount Municipal Airport; numerous other commercial establishments and residences.

For the most part, these developments have remained free from the effects of flooding, since much of the development in the flood plain has taken place since the major flood of July 1919. A

limited number of residences have been built in the low area along the south bank of the river upstream from U. S. Highway 301 (Alternate). Another low area which has periodically flooded lies along the south bank of the river just downstream from the U. S. Highway 64 bridge. At present, this area is devoted to a children's amusement area and a public park and playground.

The Intermediate Regional Flood would flood the city-owned utilities, municipal airport, residential developments, and numerous other commercial establishments. Additionally, the Standard Project Flood would inundate most of the business district along U. S. Highway 301 (Alternate), south to Hickory Street. The rapidly developing land between the Seaboard Coast Line Railroad and U. S. Highway 301 (Alternate) north of the river would also be flooded by the Standard Project Flood.

During an Intermediate Regional Flood on Tar River about 960 acres and over 350 houses and buildings located within the city limits of Rocky Mount would be subject to flooding. The area affected amounts to about 12 percent of the city. The considerably larger Standard Project Flood would inundate nearly 21 percent of the city and increase the number of houses and buildings affected to over 500. Also affected would be several miles of roads, highways, utilities, etc.

Bridges Across the Stream

Eight highway and two railroad bridges cross Tar River in the study reach. Table 3 lists pertinent elevations for these structures and shows their relation to the crest of the flood of September 22, 1945, and the Intermediate Regional Flood. Figures 1 through 6 show photographs of these bridges.

None of the bridges present serious streamflow obstructions to most floods, however, the Seaboard Coast Line Railroad trestle at Mile 85.93 would be a serious obstruction during a Standard Project Flood. Descriptions of the bridges are given in the following paragraphs.

State Road No. 1250 bridge crossing at Mile 80.35, near the lower end of the study area, is a 233-foot-long concrete and steel structure. A Standard Project Flood would barely overtop this bridge while an Intermediate Regional Flood would flood only the southern approach to this bridge. Head losses through this bridge are negligible due to the large overflow area south of the bridge.

The newest stream crossing in the reach studied is the Atlantic Avenue bridge located at Mile 83.12. This 283-foot-long concrete and steel structure would not be overtopped by the Standard Project Flood and is not an obstruction to floodflows.

At Mile 83.27, the main line of the Seaboard Coast Line Railroad crosses the Tar River on a 203-foot-long, two-span, steel through-truss bridge. The 1945 flood rose to about 5 feet below the top of the rails at this bridge and an Intermediate Regional Flood would rise to within a foot of the top of the rails. The Standard Project Flood would overtop the railroad tracks by about 2 feet.

The business route of U. S. Highway 301, designated as U. S. Highway 301-A, crosses the Tar River at Mile 83.38 on a 300-foot-long, concrete deck-girder bridge. The Intermediate Regional Flood would nearly reach the underclearance of this bridge, while the Standard Project Flood would overtop the roadway by about 1-1/2 feet.

North Carolina State Highway 43 crosses Tar River at Mile 84.24, just upstream from the Rocky Mount Mills dam on a concrete bridge that is about 300 feet long. The Intermediate Regional Flood would come to within about 1-1/2 feet of overtopping this bridge, while the Standard Project Flood would overtop the floor of the bridge by nearly 5 feet.

At Mile 85.38, the U. S. Highway 64 bridge crossing the Tar River is a 220 foot, concrete deck-girder structure which would be overtopped by the Standard Project Flood by about 4 feet. Head losses through this bridge during major floods are about 1 foot. The U. S. Weather Bureau stream gage is located about 100 feet upstream from this bridge.

The next highway bridge upstream is the Nashville Road bridge at Mile 87.13 serving State Road No. 1714. This concrete and steel deck-girder bridge is 234 feet long and is not an obstruction to floodflows. The Intermediate Regional Flood would come to within about 2.5 feet from the top of the bridge deck, while the Standard Project Flood would overtop the bridge deck by about 5 feet.

Between the last two highway bridges described above and at Mile 85.93, the spur line of the Seaboard Coast Line Railroad running from Rocky Mount to Bunn, N. C., crosses the Tar River on a 200-foot-long, deck-girder bridge. This bridge acts as the greatest obstruction to floodflows of all the bridges in the reach studied. During the Standard Project Flood, river stages immediately upstream from this structure would be about 3-1/2 feet higher due to the flow restrictions caused by this bridge. Water would flow over the top of the rails at this point at a depth of over 2 feet during the same magnitude flood. Head losses during the Intermediate Regional Flood would be about 1 foot and the bridge would not be overtopped.

U. S. Highway 301 bypasses Rocky Mount on the west side and crosses Tar River at Mile 87.74. This dual-lane, divided highway bypass route is served by twin concrete and steel deck-girder bridges, each being about 270 feet long. Although the Standard Project Flood would overtop these bridges by about 3 feet, they do not obstruct floodflows significantly.

Lemons Bridge is the most upstream bridge crossing Tar River in the reach studies, and is at Mile 90.78. This structure, serving State Road No. 1544, is a 300-foot-long, concrete, timber and steel deck-girder bridge. This bridge is constructed well above most flood stages and is not a serious obstruction. However, the flood stage for the Standard Project Flood at this point of the river would be about 2 feet higher than the elevation of the bridge floor.

FIGURE 1. BRIDGES ACROSS TAR RIVER

Upper view is upstream side of Atlantic Avenue Bridge looking south at Mile 83.12. Lower view is upstream side of State Road No. 1250 bridge at Mile 80.35. The USGS stream-gage site is on the downstream side of the lower bridge.

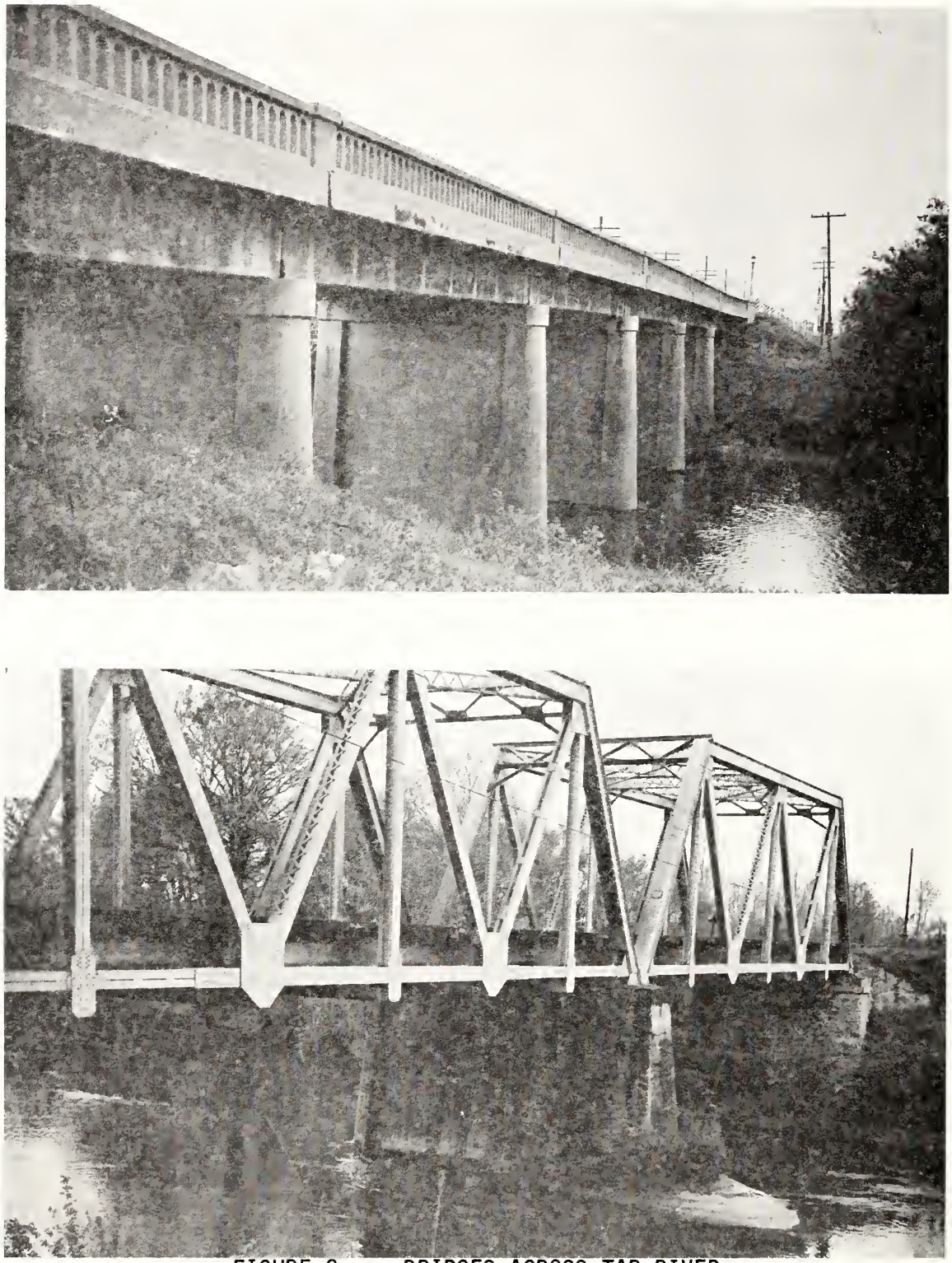


FIGURE 2. BRIDGES ACROSS TAR RIVER
Upper view is upstream side of U. S. Highway 301-A bridge at Mile 83.38. Lower view is the downstream side of the Seaboard Coast Line Railroad main line bridge at Mile 83.27.

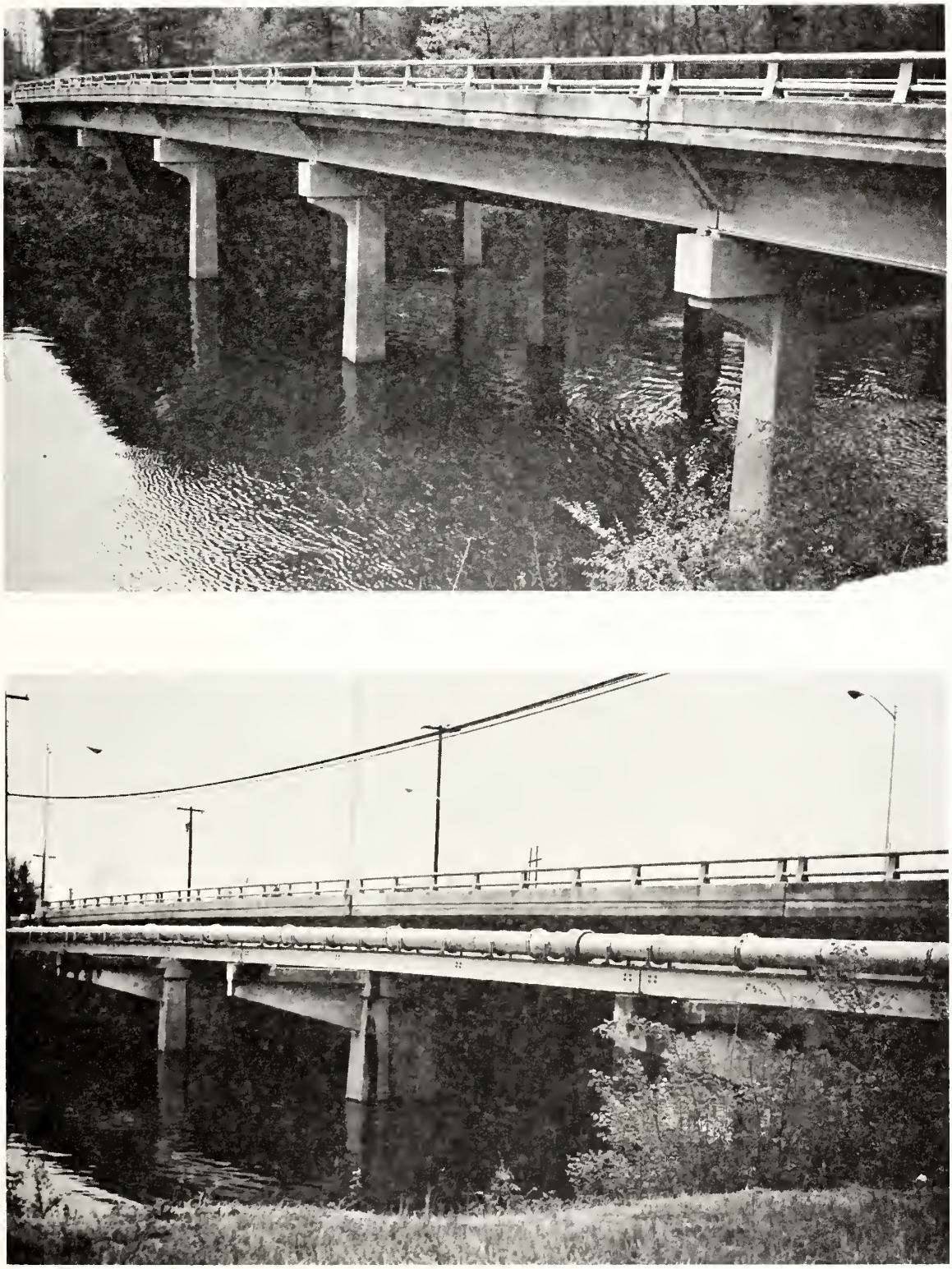


FIGURE 3. BRIDGES ACROSS TAR RIVER
Upper view is upstream side of Nashville Road bridge at Mile 87.13. Bottom view is the upstream side of U. S. Highway 64 bridge at Mile 85.38. The U. S. Weather Bureau stream gage site is just upstream from this bridge.

FIGURE 4. BRIDGE ACROSS TAR RIVER
View of the downstream side of the Seaboard Coast Line Railroad's spur line bridge at Mile 85.93.

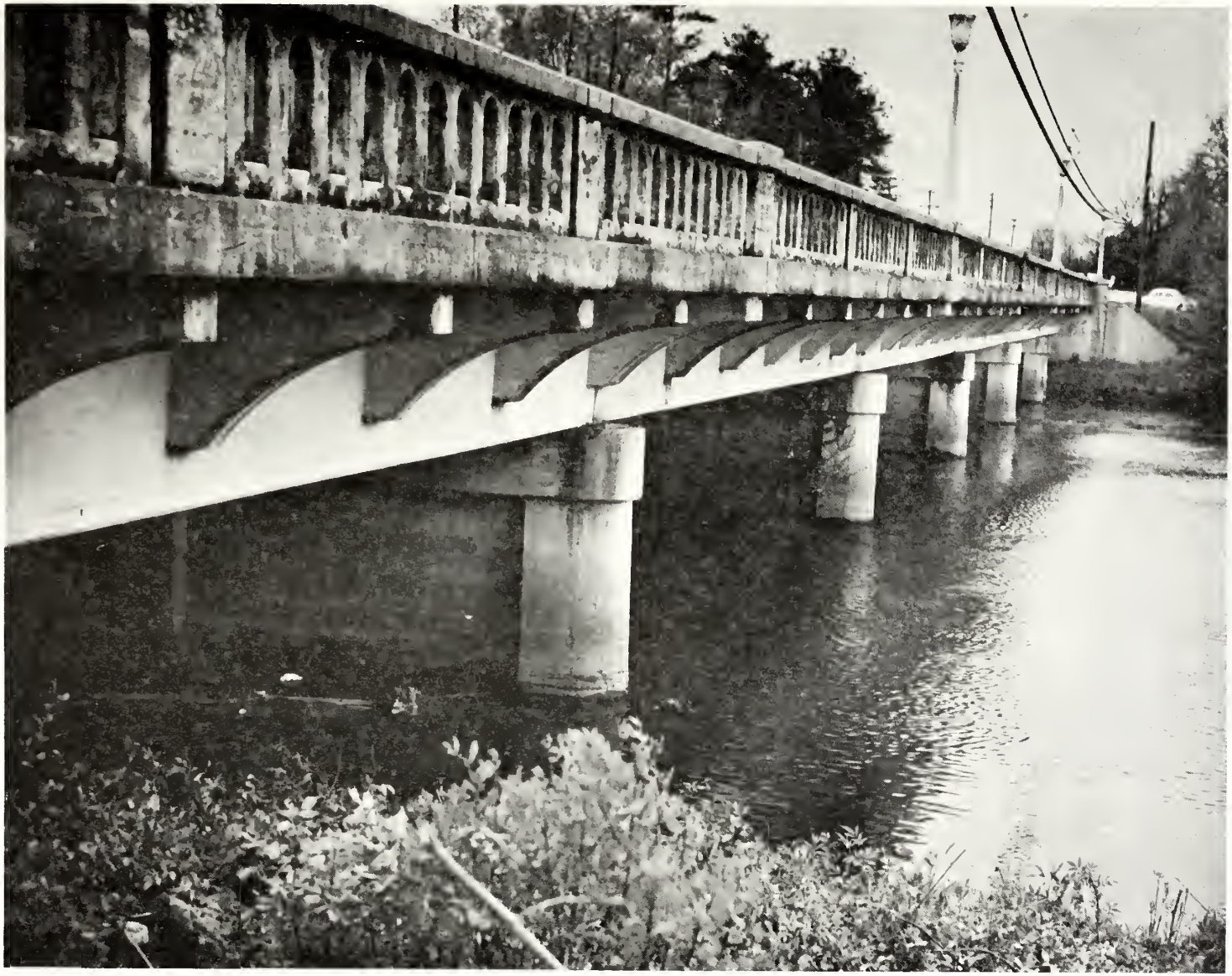


FIGURE 5. BRIDGE ACROSS TAR RIVER

View of downstream side of North Carolina Highway 43 bridge at Mile 84.24.

FIGURE 6. BRIDGES ACROSS TAR RIVER

Upper view is downstream side of Lemons Bridge (State Road No. 1544) at Mile 90.78. Lower view is looking north at the twin bridges serving U.S. Highway 301 Bypass at Mile 87.7.

Obstructions to Floodflow

The effect of obstructions due to bridges and their approach fills has been described in the previous paragraphs. The only other obstruction to flow in the reach studied is the relatively low Rocky Mount Mills dam at Mile 84.17 which has a drop of about 14 feet at low water. The difference in the water surface elevations upstream and downstream from the dam during the Intermediate Regional Flood would be 10.5 feet. During the Standard Project Flood, the difference in water surface elevation at the dam would be 9.7 feet. The September 22, 1945, flood was estimated to have had a difference in elevation of 11.5 feet at the dam. Figure 7 shows two views of the Rocky Mount Mills dam.

FIGURE 7. ROCKY MOUNT MILLS DAM

Two views of the Rocky Mount Mills Dam at Mile 84.17. The general characteristic of the natural falls below the dam is also shown.

FLOOD SITUATION

Flood Records

Records of river stages on Tar River at Rocky Mount have been maintained since July 1910, when the U. S. Weather Bureau began observations of a staff gage at a county highway near Mile 85. Once daily observations at the site with occasional crest readings have been kept since that time. The location of the gage has varied only slightly with bridge location changes. In 1963, the U. S. Geological Survey installed a wire-weight gage at S.R. 1250 bridge at Mile 80.35, which is about 5 miles downstream from the U. S. Weather Bureau gage. The gage is read once daily with medium- and high-water records being published.

To supplement the record obtained at these gaging stations, local residents were interviewed, newspaper files were searched, as were historical documents and records. These records and investigations have developed a knowledge of floods on the Tar River at Rocky Mount covering the past 60 years. For floods since July 1910, the flood stage crests are those observed at the Weather Bureau gage. The stage for the 1908 flood is from old data based on a high-water mark.

Flood Stages and Discharges

Table 4 lists crest stages and estimated discharges for the known floods exceeding bankfull stage of 9 feet at the U. S. Weather Bureau gaging station on Tar River at U. S. Highway 64 bridge. The drainage area at the gage is 803 square miles, and the gage datum is elevation 79.50 feet above mean sea level, USC&GS 1936 Supplemental adjustment. Table 5 lists the highest 10 floods in order of magnitude.

Flood Occurrences

Plate 2 shows known crest stages and years of occurrence of known floods since 1908 which have exceeded the bankfull stage of 9 feet on Tar River at the stream gaging station near U. S. Highway 64 bridge at Rocky Mount.

Duration and Rate of Rise

Plate 3 shows stage hydrographs for the Tar River at the Weather Bureau stream-gaging station at U. S. Highway 64 bridge. The floods shown are the July 1919, October 1924, and September 1945 events. The July 1919 flood rose to its crest stage in 172 hours, at an average rate of about 0.07 feet per hour, with a maximum rate of about 0.13 feet per hour, and remained above bankfull stage for 154 hours. The October 1924 flood crested after a rise of 122 hours at an average rate of about 0.08 foot per hour and a peak rate of 0.24 foot per hour. It remained out of its banks for 145 hours.

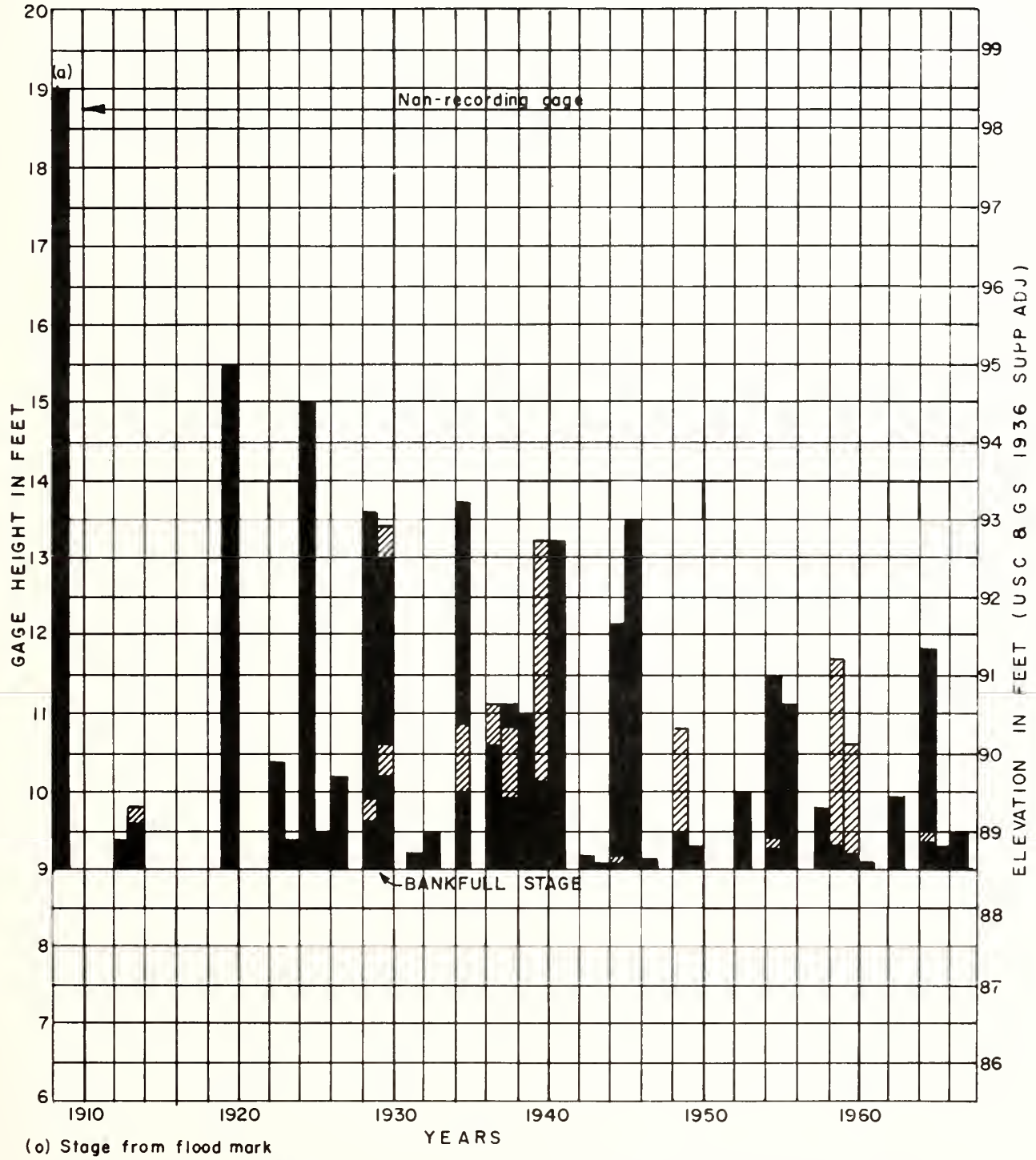
Velocities

During the September 22, 1945, flood, it is estimated that velocities in the channel of Tar River near Rocky Mount ranged up to 6 feet per second. Overbank velocities were estimated to have been up to about 0.7 feet per second. During larger floods, velocities would be greater.

Flooded Areas, Flood Profiles, and Cross Sections

Plates 6 through 10 show the approximate areas along Tar River in the vicinity of Rocky Mount which would be inundated by the Intermediate Regional Flood and also those areas which would be inundated by the Standard Project Flood. The actual limits of these overflow areas on the ground may vary somewhat from those shown on the maps, because interpolation of ground elevations between known elevation points and the scale of the maps do not permit precise plotting of the flooded area boundaries.

Plates 12, 13, 14, and 15 show the high-water profile for the flood of September 22, 1945. Also shown are the profiles for the Intermediate Regional Flood and the Standard Project Flood discussed later in this report.



(a) Stage from flood mark

Stream gage at river mile 85.38

Variations in shading on the bar graph indicates more than one flood during the year. For example in 1929 there were 4 floods; gage heights were 10.2, 10.6, 13.0 and 13.4 feet.

Zero of gage - elevation 79.50

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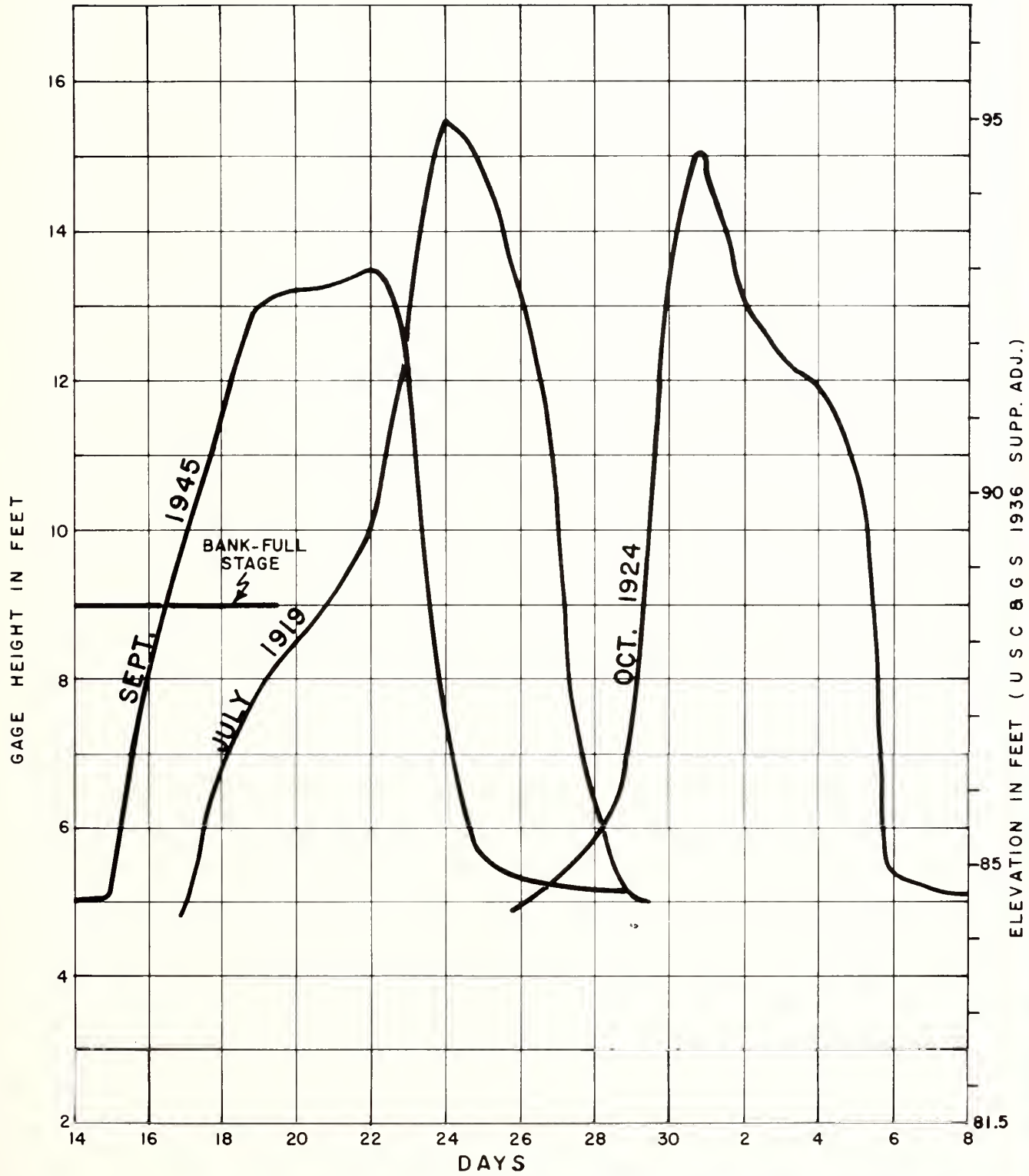
FLOODS ABOVE BANKFULL STAGE

TAR RIVER
AT U.S.W.B. GAGE
ROCKY MOUNT, NORTH CAROLINA

PLATE 2



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STAGE HYDROGRAPHS

TAR RIVER
AT U.S.W.B. GAGE
ROCKY MOUNT, NORTH CAROLINA

PLATE 3

TABLE 4

TAR RIVER AT ROCKY MOUNT, NORTH CAROLINA

FLOOD CREST ELEVATIONS ABOVE BANKFULL STAGE

1908-1967

Date of Crest	Gage Heights		Estimated Peak Discharge
	Stage feet	Elevation feet	cfs
[1]1908	[1]19.0	98.5	29,500
March 20, 1912	9.4	88.9	7,600
March 18, 1913	9.6	89.1	8,000
September 5, 1913	9.8	89.3	8,400
July 24, 1919	15.5	95.0	20,600
March 6, 1922	10.4	89.9	9,700
March 17, 1923	9.4	88.9	7,600
October 1, 1924	15.0	94.5	19,500
January 14, 1925	9.5	89.0	7,800
July 29, 1926	10.2	89.7	9,300
May 2, 1928	9.6	89.1	8,000
September 7, 1928	9.9	89.4	8,700
September 20, 1928	13.6	93.1	16,400
March 5, 1929	10.6	90.1	10,100
March 9, 1929	10.2	89.7	9,300
October 3, 1929	13.0	92.5	15,100
October 23, 1929	13.4	92.9	16,100
August 13, 1931	9.2	88.7	7,200
March 11, 1932	9.5	89.0	7,800
April 14, 1934	10.9	90.4	10,800
August 27, 1934	10.0	89.5	8,900
December 3, 1934	13.7	93.2	16,600
January 8, 1936	10.6	90.1	10,100
February 18, 1936	10.6	90.1	10,100
April 11, 1936	11.1	90.6	11,200
January 30, 1937	10.8	90.3	10,600
April 30, 1937	9.9	89.4	8,700
August 29, & 30 1937	11.1	80.6	11,200
June 25, 1938	10.5	90.0	10,000
July 30, 1938	11.0	90.5	11,000

TABLE 4--Continued

TAR RIVER AT ROCKY MOUNT, NORTH CAROLINA

FLOOD CREST ELEVATIONS ABOVE BANKFULL STAGE

1908-1967

Date of Crest	Gage Heights		Estimated Peak Discharge
	Stage feet	Elevation feet	cfs
February 12, 1939	10.1	89.6	9,100
August 30, 1939	13.2	92.7	15,400
August 18, 1940	13.2	92.7	15,400
October 18, 1942	9.2	88.7	7,200
January 21, 1943	9.1	88.6	7,000
March 22, 1944	9.1	88.6	7,000
July 17, 1944	9.2	88.7	7,200
October 1 & 2, 1944	12.1	91.6	13,300
December 1, 1944	9.1	88.6	7,000
September 22, 1945	13.5	93.0	16,200
January 2, 1946	9.1	88.7	7,200
February 13 & 14, 1946	9.1	88.6	7,000
February 16, 1948	10.8	90.3	10,600
December 3, 1948	9.5	89.0	7,800
August 30, 1949	9.3	88.8	7,400
March 6, 1952	10.0	89.5	8,900
January 18, 1954	9.4	88.9	7,600
January 24, 1954	11.5	91.0	12,000
February 23, 1954	9.3	88.8	7,400
August 22 & 23, 1955	11.1	90.6	11,200
February 6, 1957	9.8	89.3	8,400
May 11, 1958	11.7	91.2	12,400
August 28, 1958	9.3	88.8	7,400
January 2, 1959	9.2	88.7	7,200
October 25, 1959	10.6	90.1	10,100
July 30, 1960	9.1	88.6	7,000

TABLE 4--Continued

TAR RIVER AT ROCKY MOUNT, NORTH CAROLINA

FLOOD CREST ELEVATIONS ABOVE BANKFULL STAGE

1908-1967

Date of Crest	Gage Heights		Estimated Peak Discharge
	Stage feet	Elevation feet	cfs
January 11, 1962	9.9	89.4	8,700
April 10, 1964	9.4	88.9	7,600
October 6, 1964	11.8	91.3	12,600
December 28, 1964	9.5	89.0	7,800
June 18, 1965	9.3	88.8	7,400
March 4, 1966	9.5	89.0	7,800

[1]Estimated from flood mark.

TABLE 5

HIGHEST TEN KNOWN FLOODS IN ORDER OF MAGNITUDE

TAR RIVER AT ROCKY MOUNT, NORTH CAROLINA

Order No.	Date of Crest	Gage Height		Estimated Peak Discharge
		Stage feet	Elevation feet	cfs
1	[1]1908	[1]19.0	98.5	29,500
2	July 24, 1919	15.5	95.0	20.600
3	October 1, 1924	15.0	94.5	19,500
4	December 3, 1934	13.7	93.2	16,600
5	September 20, 1928	13.6	93.1	16,400
6	September 22, 1945	13.5	93.0	16,200
7	October 23, 1929	13.4	92.9	16,100
8	August 30, 1939	13.2	92.7	15,400
9	August 18, 1940	13.2	92.7	15,400
10	October 3, 1929	13.0	92.5	15,100

[1]Estimated from flood mark.

Plate 18 shows six cross sections that are typical of the total of 32 sections obtained for the Tar River in the reach investigated. The locations of all sections are shown on Plates 6, 7, 8, 10, 12 13, 14, and 15. The elevation and extent of overflow of the Intermediate Regional Flood and the Standard Project Flood are indicated on these sections.

FLOOD DESCRIPTIONS

Following are descriptions of known large floods that have occurred on Tar River in the vicinity of Rocky Mount. These are based upon newspaper accounts, historical records and field investigations. Figures 8, 9, and 10 show flood scenes around Rocky Mount taken during the August 1955 and May 1958 floods.

August 1908

This flood is considered one of the greatest known to occur in the Tar River Basin and available records indicate that it may have been the highest flood known at Rocky Mount. However, for some unknown reason, a thorough search of historical records produced no descriptions of the effects of this flood in Rocky Mount. Published records indicate that a flood stage of 19.0 feet, based on a high-water mark, was reached near the location of the present Weather Bureau gage. Further investigation revealed, however, that due to changes in the gage installation, the equivalent stage for this flood at the present gage site might be closer to 16.0 feet. It is concluded that flood stages may have been from 0.5 foot to 3.5 feet higher than any other that has occurred since the start of gage records in July 1910, and that the peak discharge at Rocky Mount ranged somewhere between 22,000 to 30,000 cubic feet per second.

July 24, 1919

The month of July 1919 was one of the wettest on record in the Tar River Basin. Numerous thundershowers kept the soil well

saturated and stream stages above normal throughout the month. The heavy shower activity reached maximum intensity on the 23rd, when from 2 to 5 inches of precipitation was recorded over the entire basin. The second highest flood stage known occurred on Tar River at Rocky Mount on the 24th and the highest stages known occurred downstream at Tarboro and Greenville on the 27th and 28th, respectively. The crest stage at the Weather Bureau gage at Rocky Mount was 15.5 feet and the estimated peak discharge was 20,600 cubic feet per second. The following are excerpts from newspaper accounts of the 1919 Rocky Mount flood:

Rocky Mount Evening Telegraph
Rocky Mount, North Carolina
Thursday, July 24, 1919

HIGH WATER MAY CAUSE WATER AND LIGHTS TO GO OFF

"Advice has been received from superintendent of water and lights, A. S. Lyons, that flood conditions at the pumping and power station may necessitate the cutting off of both lights and water everywhere in the city sometime during the day or possibly tonight. In view of this advice, all persons are urged to draw a supply of water in any obtainable vessel to be held and used in case of exigency."

"As in all probability the electric power will also be shut off, persons depending upon electric lights will do well to lay in a supply of lamps and kerosene oil, or numerous candles."

"Already the basement of the pumping station is covered with three feet of water, and a rise of another foot will reach the boilers, upon which all the machinery in the station is dependent for power. At the rapid rate at which the river is now rising, it seems certain that this point will be reached in a very few hours."

"The pumping station is already completely surrounded by water; even no part of the huge coal pile is discernible above the water."

MANY BRIDGES WASHED AWAY

"Numerous reports of heavily damaged crops and destroyed bridges have been received today from various sections of the adjoining

country. Tobacco and cotton has been damaged to the extent of hundreds of thousands of dollars and the total number of bridges washed away ranges between twelve and fifteen with many others expected to be carried away by the flood any moment."

"While none of the bridges in this immediate section has as yet given away, grave fear is entertained for several of them. Water is already flowing with a depth of several feet across the bridge at Church Street Extension (now U.S. Hwy. 301A). The structure has been moored to trees with huge cables and every precaution is being taken to assure its preservation. The water is still ten or twelve feet below the Falls road bridge and as yet no concern is felt for that structure. Today and yesterday men have been stationed on the A.C.L. trestle (now Seaboard Coast Line Railroad) to ward off the huge logs and other debris floating down the river and prevent any possible damage that the rapidly whirling obstructions might work upon the supports or buttresses of the structure."

"All the roads along the riverside are covered with several feet of water and traffic is absolutely impossible, except in a boat, anywhere on Riverside drive along the river road, or upon the lower section of the stockade road."

RIVER IS RISING AT RAPID RATE

"With an additional rise of three feet within the last twenty-four hours, the Tar River now registers a total rise of fifteen feet and three inches with a further predicted rise of three feet today and tomorrow."

"At a reading taken yesterday morning it was found that the stream had risen twelve feet, three inches, while records made at exactly the same time this morning showed the rise to be fifteen feet three inches. This increase in depth of three feet in the last twenty-four hours is the most remarkable rate at which the water has yet risen."

"Never in the history of the oldest inhabitants has the stream assumed such gigantic proportions. Thousands of acres of bottom

lands have been flooded, bridges washed away, numerous people driven from their homes which are flooded with water, and other material damages of inestimable value done by the rampant stream."

FIGURE 8. FLOOD SCENE IN ROCKY MOUNT - MAY 11, 1958

View of flood at Rocky Mount Mills Dam looking south.

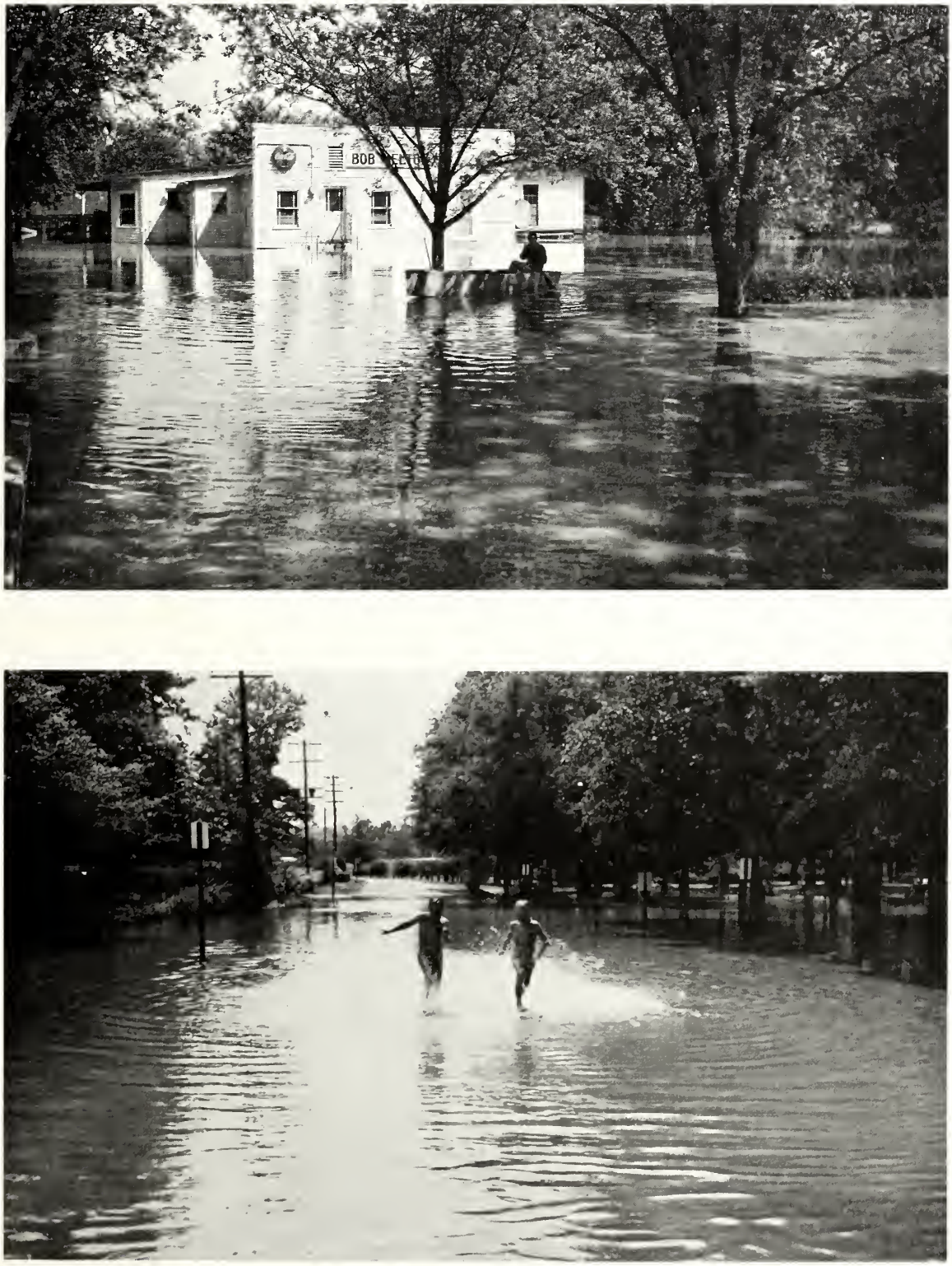


FIGURE 9. FLOOD SCENES IN ROCKY MOUNT, N. C.

Upper view is Tar River at Mile 83.5 during 11 May 1958 flood. Lower view shows a flooded portion of Riverside Drive near Mile 85 during the August 1955 flood.

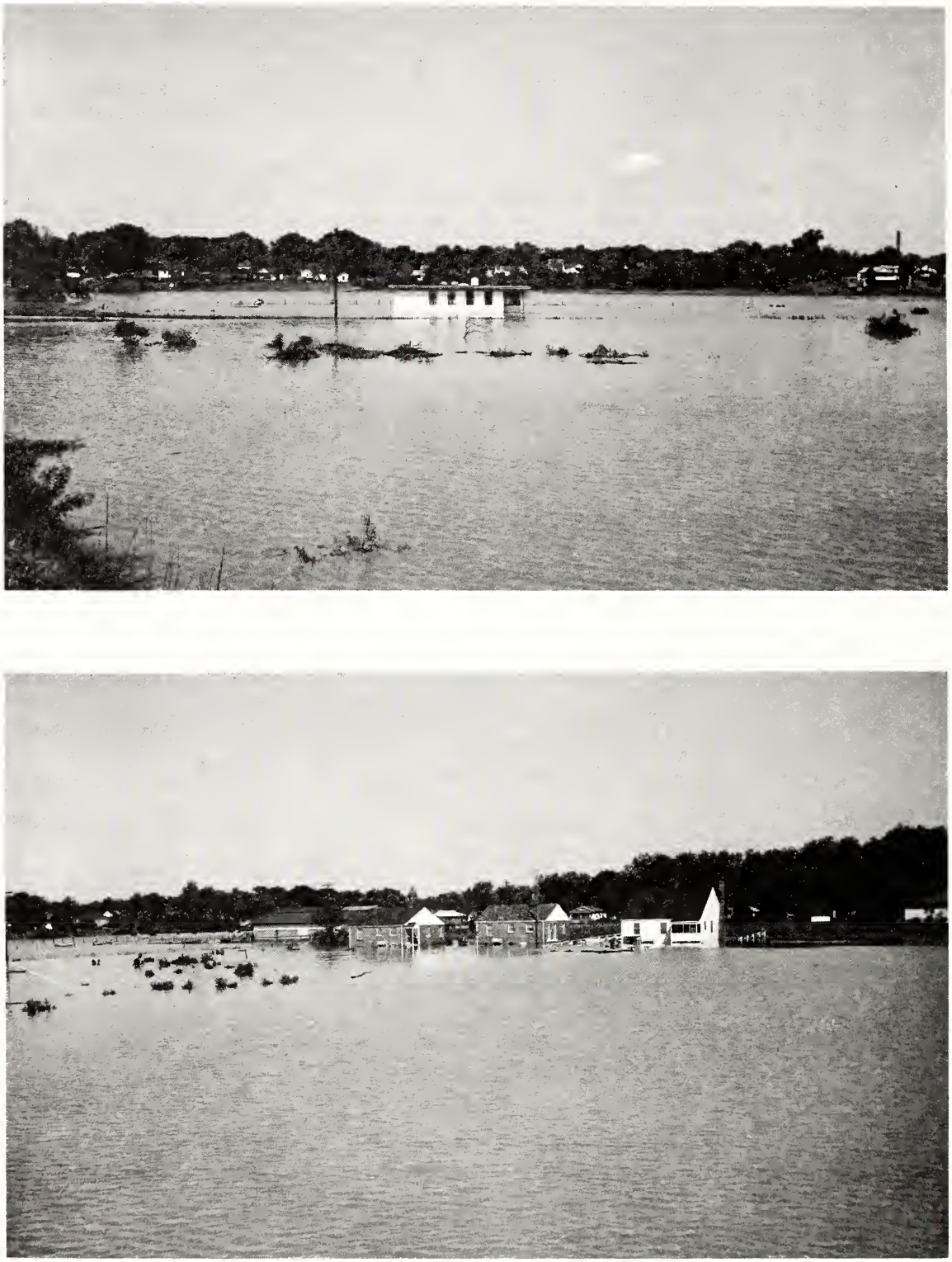


FIGURE 10. FLOOD SCENES AT ROCKY MOUNT
Two views indicating extent of flooding during a flood in 1958.

STONY CREEK

The Stream and Its Valley

Stony Creek is a tributary of Tar River entering the river at Mile 84.77. With a total drainage area of about 116 square miles, the relatively long and narrow drainage basin lies west-northwest of Rocky Mount. The basin is about 22 miles long and varies in width up to about 8 miles.

Elevations in the basin range from slightly over 400 feet in the upper end to 78 feet in the streambed at its mouth. The stream has a total length of about 25 miles and the average stream slope is about 15 feet per mile.

This investigation covers the lower 5.6 miles of Stony Creek. The total stream fall through the study area is about 20 feet and the width of the flood plain varies from about 500 feet at the upper end to about 2,800 feet at the lower end. The lower 1.4 miles is in the Tar River flood plain.

Pertinent drainage areas of Stony Creek are given in table 6.

TABLE 6

DRAINAGE AREAS IN WATERSHED OF STONY CREEK

Stream	Location	Mile Above Mouth	Drainage Area sq. mi.
Stony Creek	Mouth	0.0	116
Stony Creek	S.R. 1613	2.85	112
Stony Creek	S.R. 1544 (Upper limit of study area)	5.63	109
Stony Creek	Above Pigbasket Creek	9.5	61.3
Pigbasket Creek	Mouth		37.8

Developments in the Flood Plain

Plate 11 shows the flood plain of Stony Creek for the reach covered in this investigation. The upper 2.8 miles of the reach are relatively undeveloped or devoted to agricultural purposes. Below State Road No. 1613, at Mile 2.85, the flood plain is being converted rapidly to residential and commercial areas.

Tarrytown Mall, a relatively new shopping center, has been built in the Stony Creek flood plain and construction is underway for commercial developments across U. S. Highway 301 Bypass from Tarrytown Mall. In addition, a bank, a radio station, a service station, a fraternal order, a restaurant, and several residences are located just upstream from Tarrytown Mall. These developments are, for the most part, above the elevation of the Intermediate Regional Flood, but would be flooded to a depth of several feet by the Standard Project Flood backwater from Tar River.

Bridges Across the Stream

There are a total of six bridges across Stony Creek with 5.6-mile study reach. Views of five of the bridges are given on Figures 11, 12, and 13. U. S. Highway 64 crosses the creek twice at Mile 1.86 and Mile 4.62, and U. S. Highway 301 Bypass crosses at Mile 0.91. Each of these three crossings is served by twin concrete structures. There are three other vehicular bridges: Country Club Road, at Mile 1.55 (State Road No. 1616); State Road No. 1613, at Mile 2.85; and State Road No. 1544, at Mile 5.63, which is at the end of the study reach. Table 7 lists pertinent elevations for the bridges and shows their relation to the Intermediate Regional Flood and the Standard Project Flood.

None of the bridges are severe obstructions to floodflows. Descriptions of the bridges are given in the following paragraphs.

U. S. Highway 301 Bypass crosses Stony Creek on dual bridges, each with length of 185 feet. Backwater from the Tar River Standard

Project Flood would cover the road to a depth of about 2 feet. Head losses at this bridge are negligible.

State Road No. 1616 crosses the creek on a 162-foot-steel beam, concrete deck, four-span bridge. This bridge would be overtopped by about 5 feet during a Stony Creek Standard Project Flood, while the Intermediate Regional Flood would rise to a point just below the top of the road. In neither flood would the head loss be more than 1 foot.

The U. S. Highway 64 bridge at Mile 1.86 would not be overtopped by the Intermediate Regional Flood, but the Standard Project Flood would be about 3 feet above the bridge floor level. Head losses on the order of 1 foot could be expected during both floods.

At State Road 1613, the Standard Project Flood would overtop the roadway by about 4.5 feet, while the Intermediate Regional Flood would crest about 1.5 feet below the roadway. Head losses at this bridge would be less than 1 foot for each of the two floods shown.

The U. S. Highway 64 bridge, at Mile 4.62, would not be overtopped by either the Standard Project Flood or the Intermediate Regional Flood. Head losses at this site would be about 1 foot for the Standard Project Flood and be negligible for the Intermediate Regional Flood.

The greatest overtopping by the Standard Project flood on Stony Creek would be at State Road 1544, where the crest would be almost 10 feet above the roadway. The Intermediate Regional Flood at that point would be approximately 1.5 feet below the road. Head losses would be negligible in both cases.

FIGURE 11. BRIDGE ACROSS STONY CREEK

Looking north at U. S. Highway 301 Bypass bridges over Stony Creek at Mile 0.91.

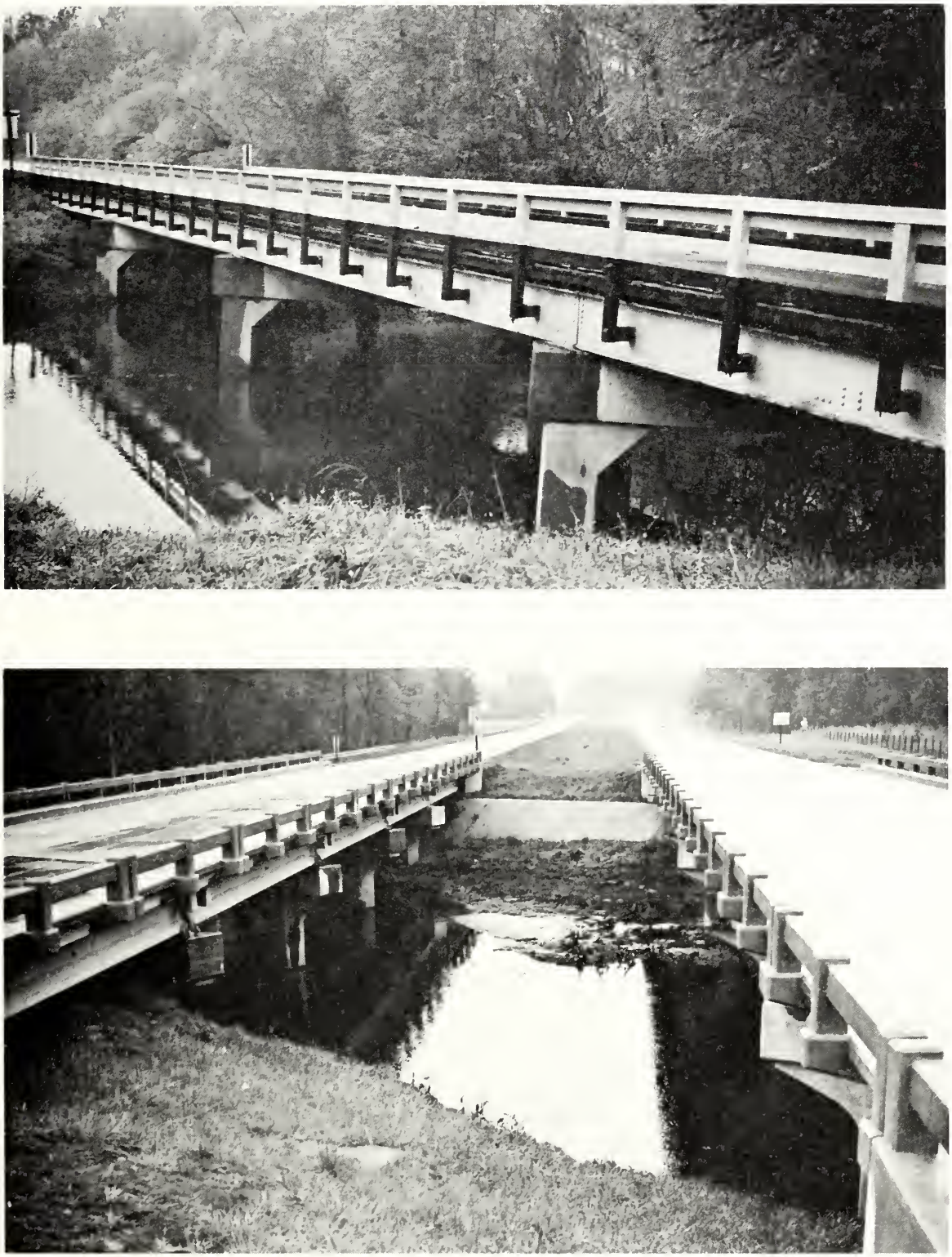


FIGURE 12. BRIDGES ACROSS STONY CREEK
Upper view is downstream side of Country Club Road (S.R. No. 1616) bridge at Mile 1.55. Lower view is looking southeast from left bank of Stony Creek at U. S. Highway 64 bridges at Mile 1.86.

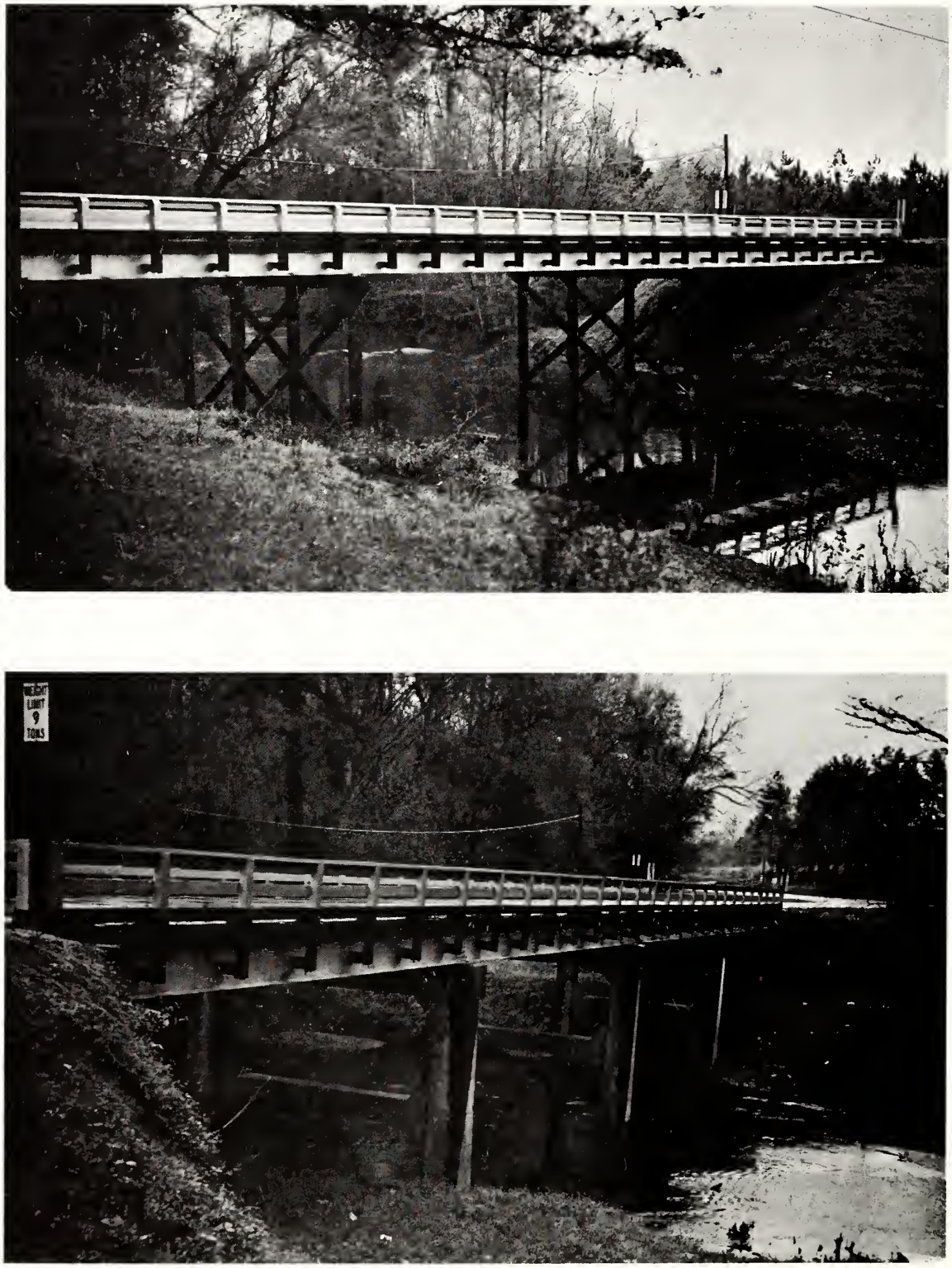


FIGURE 13. BRIDGES ACROSS STONY CREEK
Top view is downstream side of State Road No. 1613 bridge across Stony Creek at Mile 2.85. Bottom view is downstream side of State Road No. 1544 bridge at Mile 5.63.

TABLE 7

BRIDGES ACROSS STONY CREEK

Mile Above Mouth	Identification	Streambed Elevation feet	Floor Elevation feet	Intermediate Regional Flood Crest feet	Standard Project Flood Crest feet	Underclearance		
						Elevation feet	Intermediate Regional Flood Above feet	Intermediate Regional Flood Below feet
0.91	U. S. Highway 301 Bypass	77.6	99.6	95.2	101.3	94.9		0.3
1.55	State Road 1616	81.6	97.4	97.9	102.4	94.4		3.5
1.86	U. S. Highway 64	83.3	101.4	99.3	103.8	97.9		1.4
2.85	State Road 1613	85.4	106.5	104.3	110.7	104.0		0.3
4.62	U. S. Highway 64	93.5	[1]125.3	112.7	122.3	[1]121.7	9.0	
5.63	State Road 1544	97.3	118.5	117.7	128.3	115.7		2.0

[1]At center of bridge.

Obstructions to Floodflow

The effects of obstructions due to bridges or bridge approaches has been discussed in the previous paragraphs. There are no other significant obstructions to flows in the Stony Creek reach included in this study.

FLOOD SITUATION

Flood Records

There are no records of stream gages or discharges available for Stony Creek. Information on floods was obtained from interviews with local residents and from a search of newspaper files and historical records. Information obtained by field investigations and office computations were used to establish the profile for the August 1955 flood.

Flood Occurrences

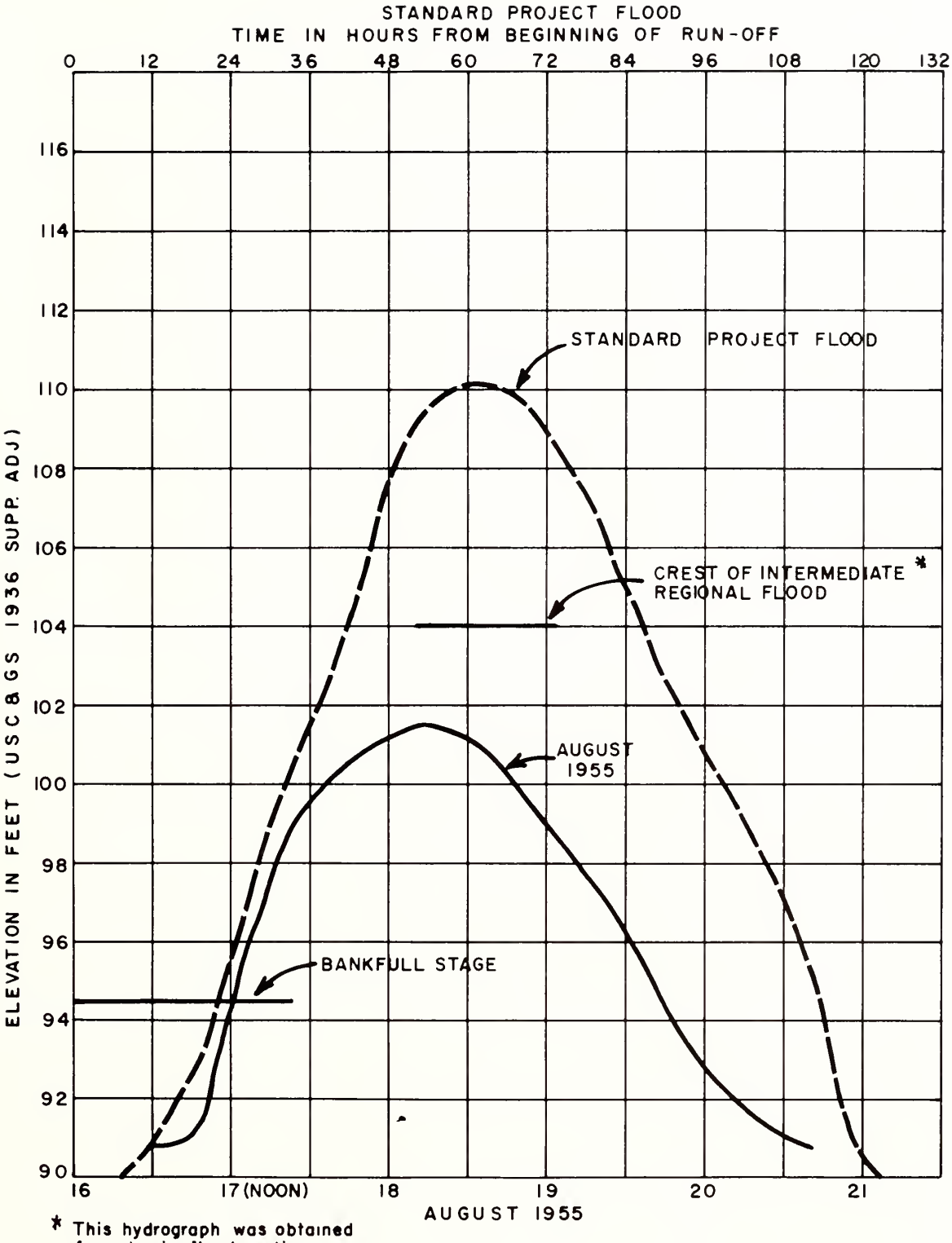
The investigation indicates major flood rises have occurred with about the same frequency on Stony Creek as on Tar River.

Duration and Rate of Rise

Plate 4 shows the computed stage hydrographs of the Standard Project Flood and the August 1955 flood for Stony Creek at State Road 1613. Since there are no stream gages on Stony Creek, there are no records of actual hydrographs.

During the August 1955 flood, it was calculated that the water surface rose 10.8 feet at an average rate of about 0.3 foot per hour with a maximum rate of approximately 0.6 foot per hour. Computations indicated the stream remained above bankfull stage for a total of 66 hours.

The Standard Project Flood would rise to its crest in about 55 hours, at an average rate of about 0.3 foot per second, and a peak rate of about 0.8 foot per second. Stony Creek would remain above bankfull stages for approximately 92 hours.



* This hydrograph was obtained from basin flood routing procedure

CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON NORTH CAROLINA DISTRICT

STAGE HYDROGRAPHS

STONY CREEK
AT S.R. 1613 NEAR
ROCKY MOUNT, NORTH CAROLINA

PLATE 4

Velocities

Along Stony Creek in the reach investigated, velocities in the channel during floods such as that of August 1955 would range up to 5 feet per second; and, in the overbank areas, velocities would be as high as 1.2 feet per second. During larger floods, velocities would be greater.

Flooded Areas, Flood Profiles, and Cross Sections

Plate 11 shows the approximate areas along Stony Creek that would be inundated by the Intermediate Regional Flood and the Standard Project Flood. The actual limits of the overflow area on the ground may vary somewhat from that shown on the aerial photograph, because the interpolation between elevation points on the ground and the scale of the map does not permit precise plotting of flooded area boundaries.

Plates 16 and 17 show the high-water profile for the flood of August 1955. Also shown are the profiles for the Intermediate Regional and Standard Project Floods which are discussed later in this report.

Plate 19 shows four cross sections that are typical of the total of 14 sections obtained for Stony Creek in the reach investigated. The locations of all sections are shown on Plates 11, 16, and 17. The elevation and extent of overflow of the Intermediate Regional Flood and the Standard Project Flood are indicated on these sections.

FUTURE FLOODS

This section of the report discusses the Standard Project Floods and the Intermediate Regional Floods on Tar River and Stony Creek in the vicinity of Rocky Mount, North Carolina, and some of the hazards of great floods. Floods of the size of the Standard Project Flood represent reasonable upper limits of expected flooding. Those of the size of the Intermediate Regional Flood represent floods that may reasonably be expected to occur more frequently, although they will not be as high as the infrequent Standard Project Flood.

Large floods have been experienced in the past on streams in the general geographical and physiographical region of Rocky Mount. Heavy storms similar to those causing these floods could occur over the watersheds of Tar River and Stony Creek. In this event, floods would result on these streams comparable in size with those experienced on neighboring streams. It is therefore desirable, in connection with any determination of future floods which may occur on the Tar River and Stony Creek, to consider storms and floods that have occurred in the region on watersheds whose topography, watershed cover, and physical characteristics are similar to those of these three streams.

DETERMINATION OF INTERMEDIATE REGIONAL FLOODS

The Intermediate Regional Flood is defined as a flood having an average frequency of occurrence in the order of once in 100 years, at a designated location, although the flood may occur in any year. Some probability estimates are based on statistical analyses of streamflow records available for the watershed under study, but limitations in such records usually require analyses of rainfall and runoff characteristics in the "general region" of the area under study. The Intermediate Regional Flood represents a major flood, although it is much less severe than the Standard Project Flood.

In order to determine the Intermediate Regional Floods for Tar River and Stony Creek in the vicinity of Rocky Mount, statistical

studies were made using the U. S. Weather Bureau record of flood data for Tar River near U. S. Highway 64 bridge, and other available records for the Tar and Neuse River basins. Table 8 lists the maximum known floods that have occurred on watersheds comparable with Tar River and Stony Creek at Rocky Mount and within the same geographical region.

Results of the studies indicate that the Intermediate Regional Flood at Rocky Mount on Tar River at the Weather Bureau's gaging station would have a peak discharge of 26,500 cubic feet per second and would be about 30 percent greater than the July 1919 flood. The Intermediate Regional Flood for Stony Creek would have a peak discharge at its mouth in the order of 8,300 cubic feet per second.

TABLE 8

MAXIMUM KNOWN FLOOD DISCHARGES ON STREAMS IN THE REGION OF ROCKY MOUNT

Stream and Gage Location	Drainage Area sq. mi.	Years of Record	Date	Peak Discharge cfs	Peak Discharge cfs per sq. mi.
Tar River near Tar River, N. C.	167	24	Aug. 18, 1955	13,100	78
Tar River at Louisburg, N. C.	430	33	Dec. 3, 1934	[1]20,000	47
Tar River near Nashville, N. C.	701	35	Dec. 3, 1934	16,900	24
Tar River at Rocky Mount, N. C.	803	47	July 24, 1919	[1]23,500	29
Tar River at Tarboro, N. C.					
Fishing Creek near Enfield, N. C.	521	40	Aug. 18, 1940	12,600	24
Eno River at Hillsborough, N. C.	67	33	Sep. 18, 1945	11,000	165
Flat River at Bahama, N. C.	150	35	July 26, 1938	20,000	133
Neuse River near Northside, N. C.	526	33	Sep. 18, 1945	36,600	70
Neuse River near Neuse, N. C.	790	49	Sep. 21, 1945	[1]24,200	31
Neuse River near Clayton, N. C.	1,140	37	Sep. 19, 1945	22,900	20
Little River near Princeton, N. C.	229	36	Oct. 6, 1964	7,150	31
Contentnea Creek at Wilson, N. C.	236	24	Jan. 24, 1954	4,940	21
Contentnea Creek at Hookerton, N. C.	729	37	Oct. 7, 1964	17,200	23

[1]Estimated.

Peak discharges of the Intermediate Regional Floods on Tar River and Stony Creek are shown in table 9.

Intermediate Regional Floods may occur on Tar River in the reach investigated that would be from 3.5 to 4.5 feet higher than the September 1945 flood, the sixth highest flood known. On Stony Creek, an Intermediate Regional Flood would be 2 to 5 feet higher than the August 1955 flood.

DETERMINATION OF STANDARD PROJECT FLOODS

Only in rare instances has a specific stream experienced the largest flood that is likely to occur. Severe as the maximum known flood may have been on any given stream, it is a commonly accepted fact that, in practically all cases, sooner or later a larger flood can and probably will occur. The Corps of Engineers, in cooperation with the Weather Bureau, has made broad and comprehensive studies and investigations based on the vast records of experienced storms and floods and has evolved generalized procedures for estimating the flood potential of streams. These procedures have been used in determining the Standard Project Floods. It is defined as the largest flood that can be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical region involved.

Standard Project Flood estimates have been made for Tar River at the Weather Bureau and USGS gaging stations at Rocky Mount, and for Stony Creek at its mouth. The storm rainfall used for Tar River amounts to 7.7 inches in 6 hours, 10.7 inches in 24 hours, and a total of 13.8 inches in 96 hours. Rainfall amounts used for Stony Creek are about 20 percent greater. Peak discharges of the Standard Project Floods on Tar River and Stony Creek are shown in table 9, and compared with the Intermediate Regional Floods.

TABLE 9

STANDARD PROJECT AND INTERMEDIATE REGIONAL FLOODS

PEAK DISCHARGE

Stream	Location	River Mile	Drainage Area sq. mi.	Intermediate Regional Flood Discharge cfs	Standard Project Flood Discharge cfs
Tar River	S.R. No. 1250 bridge (USGS Gage)	80.4	933	28,000	61,760
	U.S. Hwy. 64 bridge (USWB Gage)	85.4	803	26,500	58,570
Stony Creek	Mouth	0.0	116	8,300	25,260

Frequency

It is not practical to assign a frequency to the Standard Project Flood. The occurrence of such a flood would be a rare event; however, it could occur in any year.

Possible Larger Floods

Floods larger than the Standard Project Flood are possible; however, the combination of factors that would be necessary to produce such floods would seldom occur. The consideration of floods of this magnitude is of greater importance in some problems than in others but should not be overlooked in the study of any problem.

HAZARDS OF GREAT FLOODS

The amount and extent of damage caused by any flood depends in general upon how much area is flooded, the height of flooding, the velocity of flow, the rate of rise, and the duration of flooding.

Areas Flooded and Heights of Flooding

The areas along Tar River and Stony Creek flooded by the Standard Project Flood and the Intermediate Regional Flood are shown on Plates 6 through 9. Depths of flow can be estimated from the crest profiles which are shown on Plates 12 through 17.

The profiles for the streams were computed by using stream characteristics for selected reaches as determined from observed flood profiles, topographic maps, and valley cross sections which were surveyed in 1967. The elevations shown on Plates 12 through 17 and the overflow areas shown on Plates 6 through 11 have been determined with an accuracy consistent with the purposes of this study and the accuracy of the basic data.

The profiles of the Standard Project Flood and the Intermediate Regional Flood depend in part upon the degree of destruction or clogging of various bridges during the flood. Because it is impossible to forecast these events, it was assumed that all bridge structures would stand, and that no clogging would occur.

The Standard Project Flood profile for Tar River is 7.5 to 12 feet higher than the September 1945 flood. The maximum difference occurs in upstream reaches of the study area and is the result of narrowing of the valley. The Standard Project Flood profile for Stony Creek is from 7 to 16 feet higher than the profile of the August 1955 flood. At the mouth of Stony Creek the backwater from the Tar River Standard Project Flood is 10.5 feet higher than the backwater of the August 1955 flood.

The Intermediate Regional Flood profile for Tar River is 3.5 to 4.5 feet higher than the September 1945 flood. The maximum difference occurs in the upstream reaches of the study and is the result of narrowing of the valley. The Intermediate Regional Flood profile for Stony Creek is from 2 to 5 feet higher than the August 1955 flood along most of the stream, although the difference is as much as 8 feet near the mouth of the stream due to backwater from Tar River.

Figures 14 through 18 on pages 54 through 58 show the heights that would be reached by the Standard Project Flood and the Intermediate Regional Flood on facilities presently existing within the flood plain in the vicinity of Rocky Mount.

FIGURE 14. FLOOD HEIGHTS ALONG TAR RIVER

Arrows show heights of the Standard Project Flood and the Intermediate Regional Flood. The July 1919 flood is estimated to have been approximately 2 feet below the Intermediate Regional Flood.

FIGURE 15. FLOOD HEIGHT AT ROCKY MOUNT MILLS
The height of the Standard Project Flood is shown by the arrow. The Intermediate Regional Flood would be 1.3 feet below the bottom of the rod.

FIGURE 16. FLOOD HEIGHTS ALONG TAR RIVER

Arrows show heights of the Standard Project Flood and the Intermediate Regional Flood at the Rocky Mount Arts and Craft Center just upstream from Nashville Road. The July 1919 flood is estimated to have been about 3 feet lower than the Intermediate Regional Flood.

FIGURE 17. FLOOD HEIGHT AT TARRYTOWN MALL
The arrow shows the level of the Standard Project Flood at Tarrytown Mall. The Intermediate Regional Flood would be almost 2 feet below the base of the rod, and it is estimated that the July 1919 flood was about 4 feet below the base of the rod.

FIGURE 18. FLOOD HEIGHTS ALONG STONY CREEK

Arrows show the heights of the Standard Project Flood and the Intermediate Regional Flood at Stony Creek Mile 1.82. The December 1965 Flood was about 5 feet below the Intermediate Regional Flood and estimated to be about 1 foot below the September 1955 flood.

Velocities, Rates of Rise, and Duration

Water velocities during floods depend largely upon the size and shape of the cross section, the condition of the stream, and the bed slope, all of which vary on different streams and at different locations on the same streams.

Table 10 lists the maximum velocities that would occur in the main channel and overbank areas of Tar River and Stony Creek during the Intermediate Regional Floods.

TABLE 10

INTERMEDIATE REGIONAL FLOODS

MAXIMUM VELOCITIES

Stream	Location	Maximum Velocities	
		Channel ft. per sec.	Overbank ft. per sec.
Tar River	Mile 90.1	7	1
Stony Creek	Mile 2.8	5	1

Table 11 lists the maximum velocities that would occur in the main channel and overbank areas of Tar River and Stony Creek during the Standard Project Floods.

TABLE 11

STANDARD PROJECT FLOODS

MAXIMUM VELOCITIES

Stream	Location	Maximum Velocities	
		Channel ft. per sec.	Overbank ft. per sec.
Tar River	Mile 90.1	9	1
Stony Creek	Mile 5.0	8	2

Table 12 lists the total rise above low water to the crest of the Intermediate Regional Flood, the maximum rate of rise, and the

duration above bankfull stage of the Intermediate Regional Flood for Tar River and Stony Creek.

TABLE 12

INTERMEDIATE REGIONAL FLOODS
RATES OF RISE AND DURATION

Stream	Location	Height of Rise feet	Time of Rise hours	Maximum Rate of Rise ft. per hr.	Duration above Bankfull hours
Tar River	U.S. Highway 64 bridge (USWB Gage)	13.6	108	0.2	140
Stony Creek	Mile 2.85 (S.R. 1613)	13.6	54	0.4	78

Table 13 lists the total rise above low water to the crest of the Standard Project Flood, the maximum rate of rise, and the duration above bankfull stage of the Standard Project Flood for Tar River and Stony Creek.

TABLE 13

STANDARD PROJECT FLOODS
RATES OF RISE AND DURATION

Stream	Location	Height of Rise feet	Time of Rise hours	Maximum Rate of Rise ft. per hr.	Duration above Bankfull hours
Tar River	U.S. Highway 64 bridge (USWB Gage)	18.8	116	0.3	172
Stony Creek	Mile 2.85 (S.R. 1613)	19.2	55	0.3	92

These rapid rates of rise and high stream velocities in combination with deep, fairly long-duration flooding would create a hazardous situation in developed areas. Velocities greater than 3 feet per second, combined with depths of 3 feet or greater, are generally considered hazardous.

GLOSSARY OF TERMS

Flood. An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or stream or an ocean, lake, or other body of standing water.

Normally, a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Peak. The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest.

Flood Plain. The relatively flat area or lowlands adjoining the channel of a river, stream or watercourse or ocean, lake, or other body of standing water, which has been or may be covered by floodwater.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Head Loss. The effect of obstructions, such as narrow bridge openings or buildings that limit the area through which water must flow, raising the surface of the water upstream from the obstruction.

Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the "general region of the watershed."

Left Bank. The bank on the left side of a river, stream, or watercourse, looking downstream.

Low Steel (or Underclearance). See "underclearance."

Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40% to 60% of the Probable Maximum Floods for the same basins. Such floods, as used by the Corps of Engineers, are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance. The lowest point of a bridge or other structure over or across a river, stream, or watercourse that limits the opening through which water flows. This is referred to as "low steel" in some regions.

AUTHORITY, ACKNOWLEDGEMENTS, AND INTERPRETATION OF DATA

This report has been prepared in accordance with the authority granted by Section 206 of the Flood Control Act of 1960 (P.L. 86-645), as amended.

* * *

Assistance and cooperation of the Environmental Science Services Administration - Weather Bureau, U. S. Geological Survey, North Carolina Department of Water and Air Resources, the City of Rocky Mount, and private citizens in supplying useful data, are appreciated.

* * *

This report presents the local flood situation for Rocky Mount. The Wilmington District of the Corps of Engineers will, upon request, provide interpretation and limited technical assistance in application of data presented herein, and will provide other available flood data related thereto.

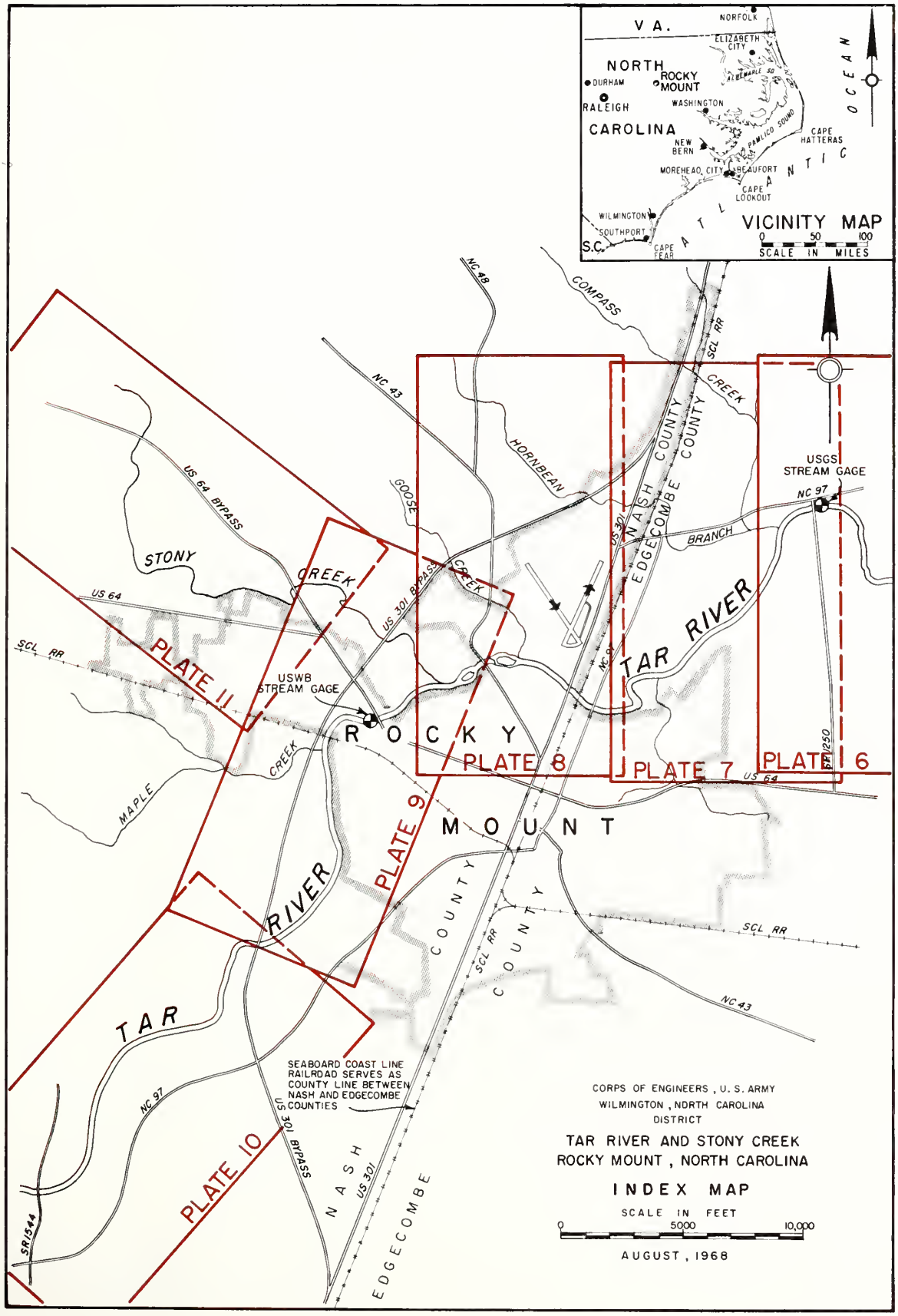

VICINITY MAP
SCALE IN MILES
0 50 100
VA.
NORFOLK
ELIZABETH CITY
NORTH CAROLINA
DURHAM
RALEIGH
ROCKY MOUNT
WASHINGTON
ALBEMARLE SD.
PAMLICO SOUND
NEW BERN
CAPE HATTERAS
MOREHEAD CITY
BEAUFORT
CAPE LOOKOUT
WILMINGTON
SOUTHPORT
CAPE FEAR
S.C.
ATLANTIC OCEAN
NC 48
COMPASS
NC 43
SCL RR
CREEK
HORNBEAN
GOOSE
US 64 BYPASS
STONY
US 64
US 301 BYPASS
NASH COUNTY
EDGECOMBE COUNTY
USGS STREAM GAGE
NC 97
BRANCH
TAR RIVER
USWB STREAM GAGE
PLATE 11
PLATE 8
PLATE 7
PLATE 6
ROCKY
MOUNT
MAPLE
PLATE 9
RIVER
TAR
PLATE 10
SR 1544
SEABOARD COAST LINE RAILROAD SERVES AS COUNTY LINE BETWEEN NASH AND EDGECOMBE COUNTIES
US 301
NASH
EDGECOMBE
COUNTY
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA
DISTRICT
TAR RIVER AND STONY CREEK
ROCKY MOUNT, NORTH CAROLINA
INDEX MAP
SCALE IN FEET
0 5000 10,000
AUGUST, 1968

PLATE 5


SEE PLATE 7
SPRINGFIELD ROAD SR 1250
USGS GAGE
MILE 80
RIVER
TAR
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
MILE 79
BEGIN STUDY REACH
4
3
2
1
LEGEND
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
16 CROSS SECTION
NOTE: LIMITS OF OVERFLOWS INDICATED MAY VARY SLIGHTLY FROM ACTUAL LOCATIONS ON GROUND AS EXPLAINED IN THE REPORT.
CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA
FLOODED AREA
TAR RIVER
ROCKY MOUNT, NORTH CAROLINA
1000 0 1000 2000
SCALE IN FEET

PLATE 6

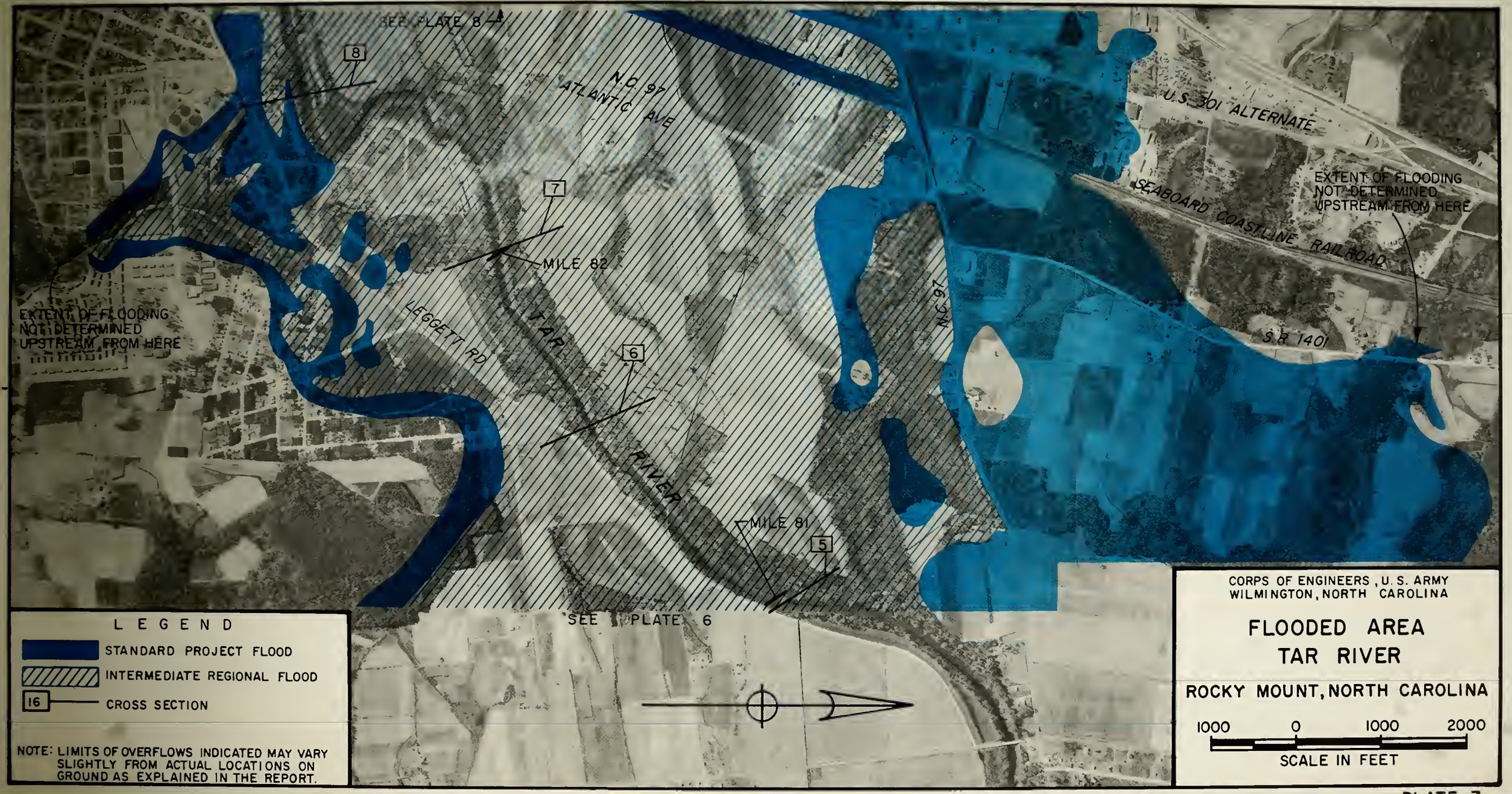

SEE PLATE 8
8
N.C. 97
ATLANTIC AVE
7
MILE 82
LEGGETT RD
TAR
RIVER
6
N.C. 97
U.S. 301 ALTERNATE
SEABOARD COASTLINE RAILROAD
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
S.R. 1401
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
MILE 81
5
SEE PLATE 6
LEGEND
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
16 CROSS SECTION
NOTE: LIMITS OF OVERFLOWS INDICATED MAY VARY SLIGHTLY FROM ACTUAL LOCATIONS ON GROUND AS EXPLAINED IN THE REPORT.
CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA
FLOODED AREA
TAR RIVER
ROCKY MOUNT, NORTH CAROLINA
1000 0 1000 2000
SCALE IN FEET

PLATE 7

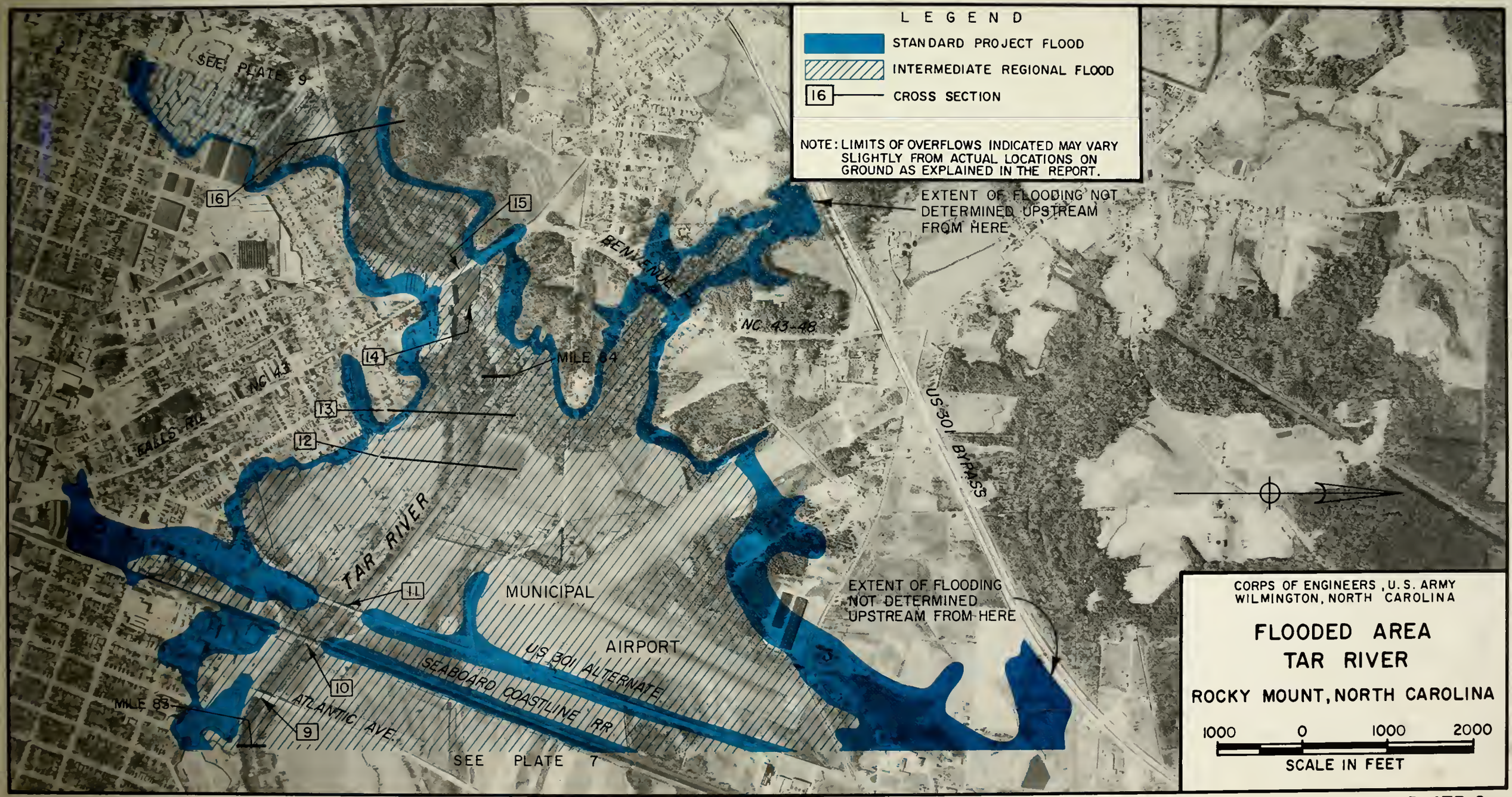
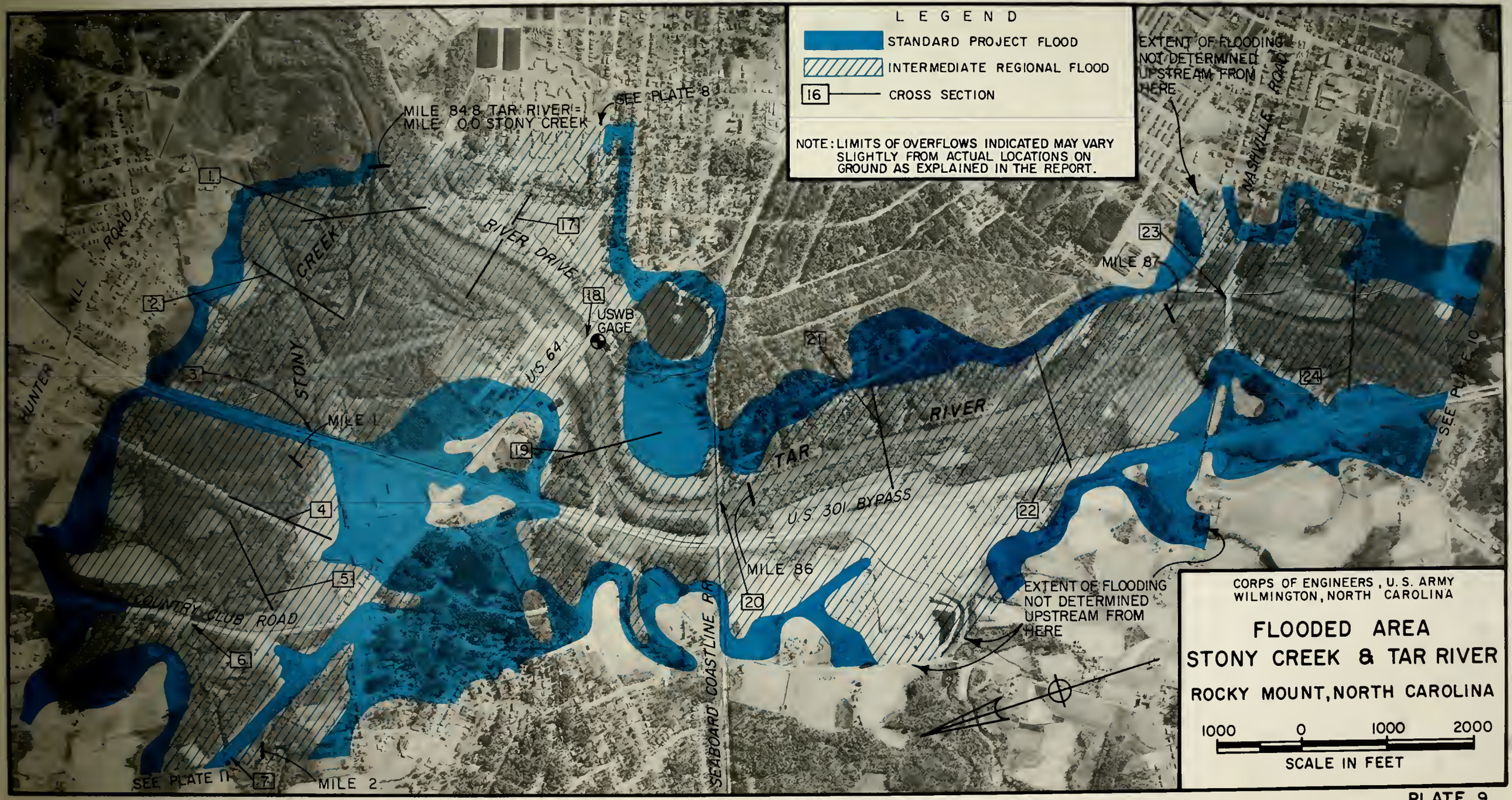

LEGEND
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
16 CROSS SECTION
NOTE: LIMITS OF OVERFLOWS INDICATED MAY VARY SLIGHTLY FROM ACTUAL LOCATIONS ON GROUND AS EXPLAINED IN THE REPORT.
SEE PLATE 9
16
15
14
13
12
11
10
9
MILE 84
MILE 83
BENVENUE
NC 43-48
NC 43
FALLS RD
TAR RIVER
MUNICIPAL AIRPORT
US 301 ALTERNATE
SEABOARD COASTLINE RR
ATLANTIC AVE.
SEE PLATE 7
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
US 301 BYPASS
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA
FLOODED AREA
TAR RIVER
ROCKY MOUNT, NORTH CAROLINA
1000 0 1000 2000
SCALE IN FEET

PLATE 8



CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA

FLOODED AREA
STONY CREEK & TAR RIVER
ROCKY MOUNT, NORTH CAROLINA

1000 0 1000 2000
SCALE IN FEET

PLATE 9


SR 1770
WEST MOUNT DRIVE
MILE 88
MILE 89
MILE 90
TAR
RIVER
28
29
30
31
32
25
26
27
SR 1544
STAGECOACH ROAD
NC 97
US 301 BYPASS
JOYNERS CROSSROADS
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
LEGEND
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
16 CROSS SECTION
NOTE: LIMITS OF OVERFLOWS INDICATED MAY VARY SLIGHTLY FROM ACTUAL LOCATIONS ON GROUND AS EXPLAINED IN THE REPORT.
CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA
FLOODED AREA
TAR RIVER
ROCKY MOUNT, NORTH CAROLINA
1000 0 1000 2000
SCALE IN FEET

PLATE 10

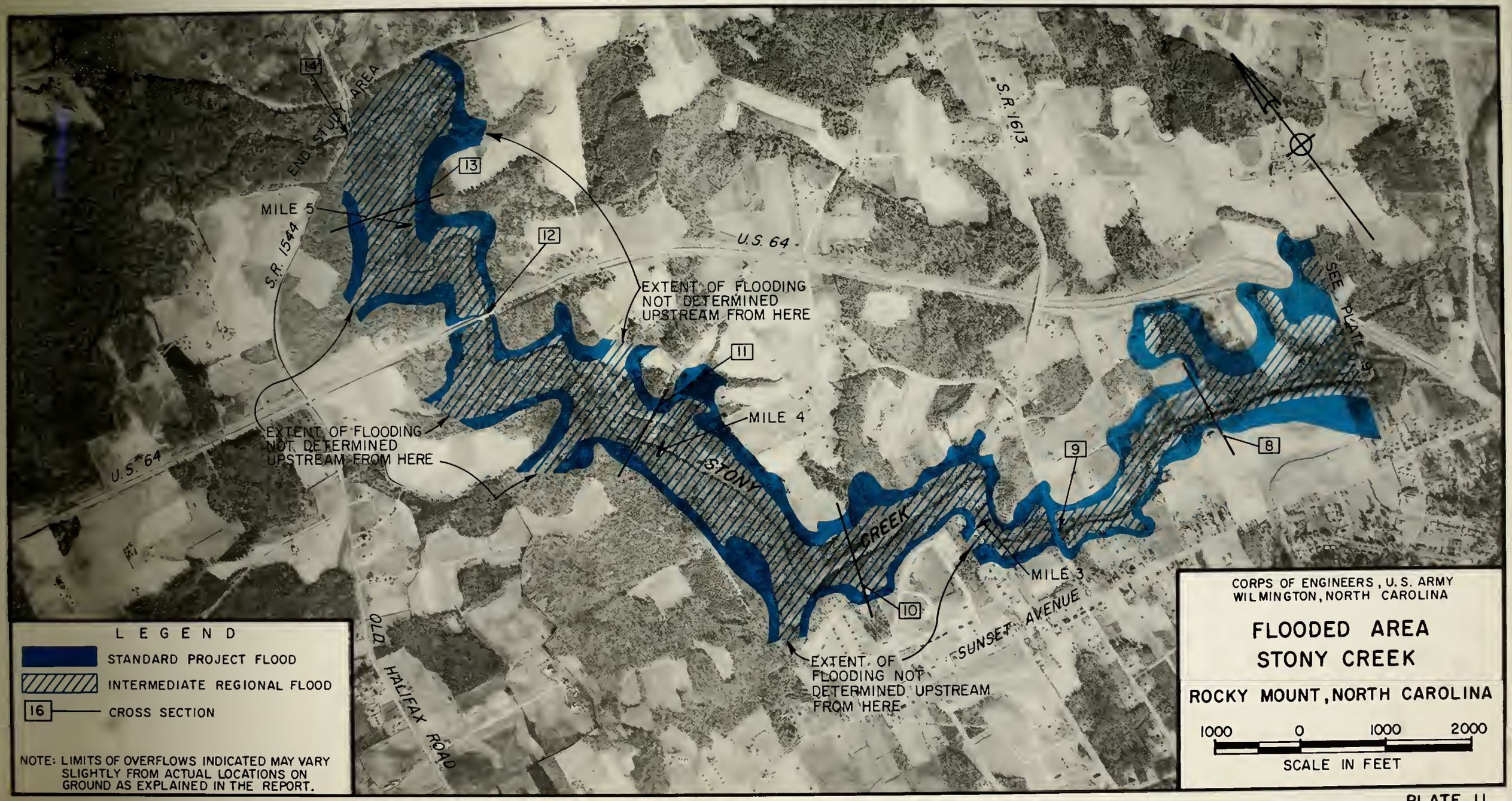
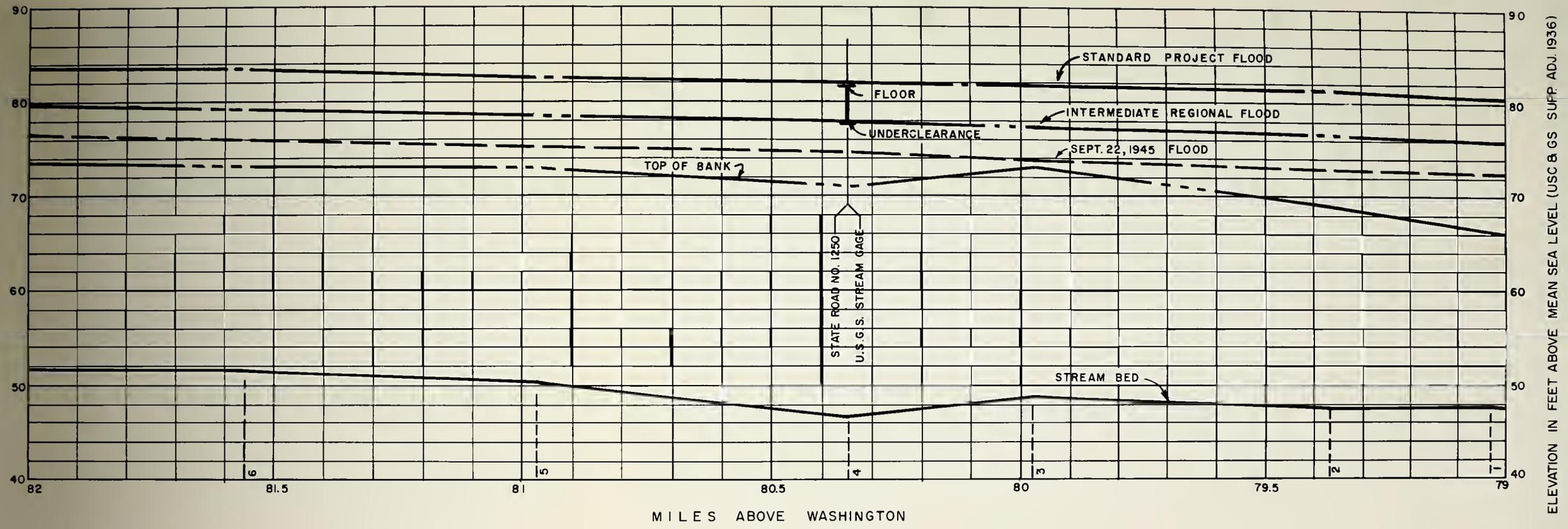

14
END STUDY AREA
13
MILE 5
S.R. 1544
12
U.S. 64
S.R. 1613
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
11
MILE 4
STONY
CREEK
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
U.S. 64
9
8
SEE PLATE 9
MILE 3
10
SUNSET AVENUE
EXTENT OF FLOODING NOT DETERMINED UPSTREAM FROM HERE
OLD HALIFAX ROAD
LEGEND
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
16
CROSS SECTION
NOTE: LIMITS OF OVERFLOWS INDICATED MAY VARY SLIGHTLY FROM ACTUAL LOCATIONS ON GROUND AS EXPLAINED IN THE REPORT.
CORPS OF ENGINEERS, U.S. ARMY
WILMINGTON, NORTH CAROLINA
FLOODED AREA
STONY CREEK
ROCKY MOUNT, NORTH CAROLINA
1000 0 1000 2000
SCALE IN FEET

PLATE 11



—— 7 —— CROSS SECTION LOCATION AND NUMBER

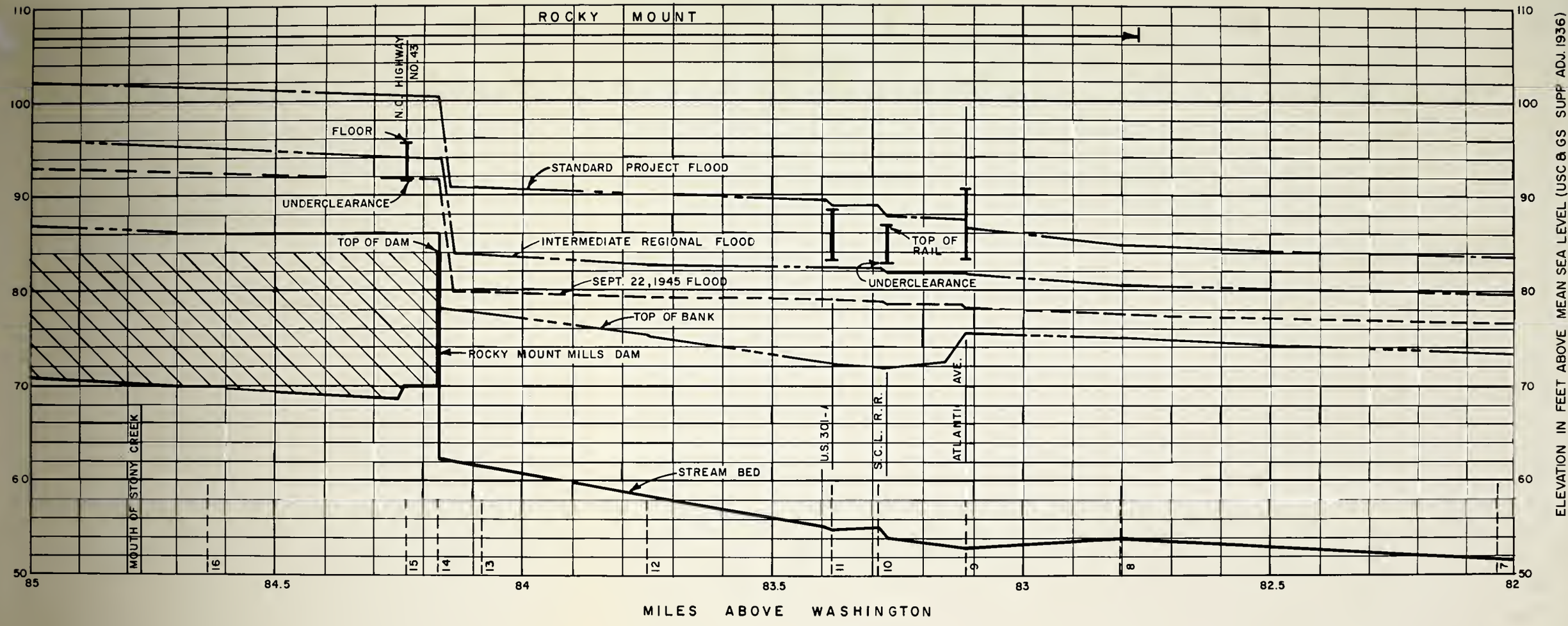
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

FLOOD PROFILES

TAR RIVER

ROCKY MOUNT, NORTH CAROLINA
AUGUST, 1968

PLATE 12



—— 7 —— CROSS SECTION LOCATION AND NUMBER

POOL IMPOUNDED BY ROCKY MOUNT MILLS DAM.

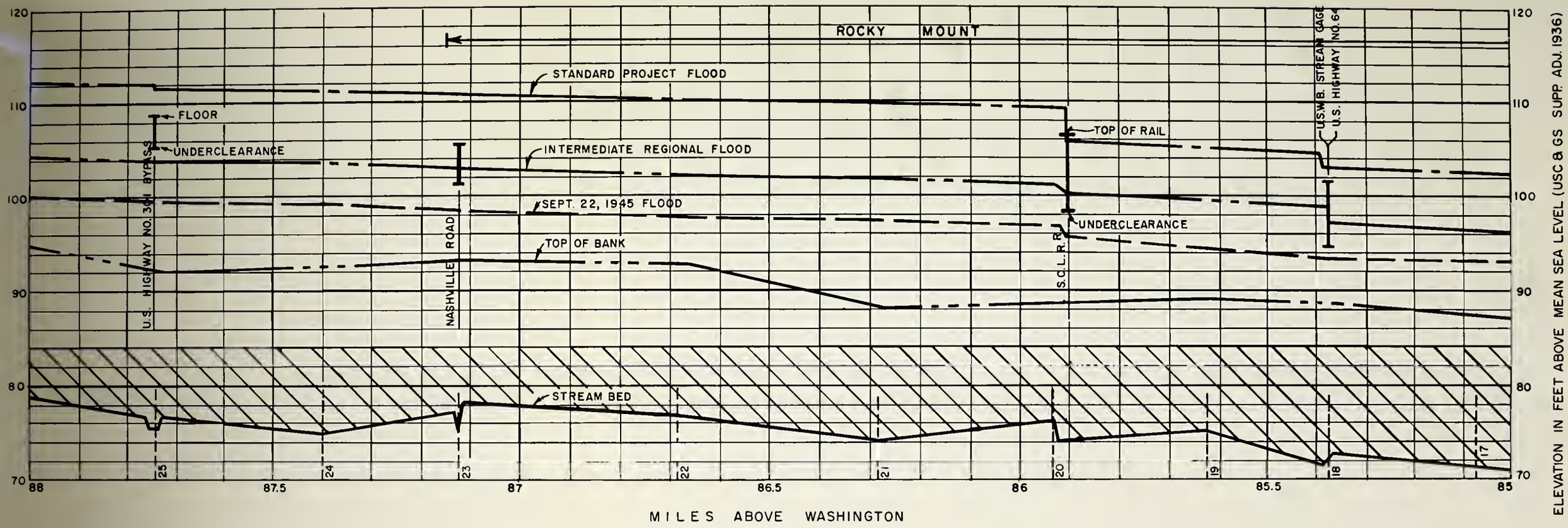
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

FLOOD PROFILES

TAR RIVER

ROCKY MOUNT, NORTH CAROLINA
AUGUST, 1968

PLATE 13



7 CROSS SECTION LOCATION AND NUMBER

POOL IMPOUNDED BY ROCKY MOUNT MILLS DAM.

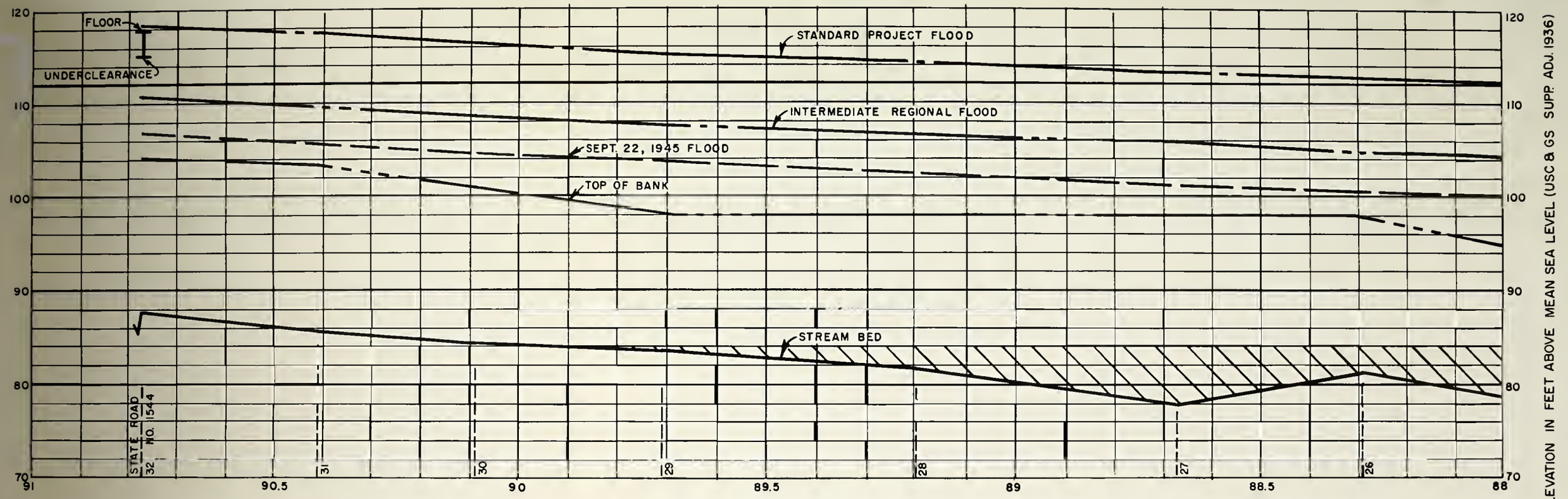
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

FLOOD PROFILES

TAR RIVER

ROCKY MOUNT, NORTH CAROLINA
AUGUST, 1968

PLATE 14



—— 7 —— CROSS SECTION LOCATION AND NUMBER

POOL IMPOUNDED BY ROCKY MOUNT MILLS DAM.

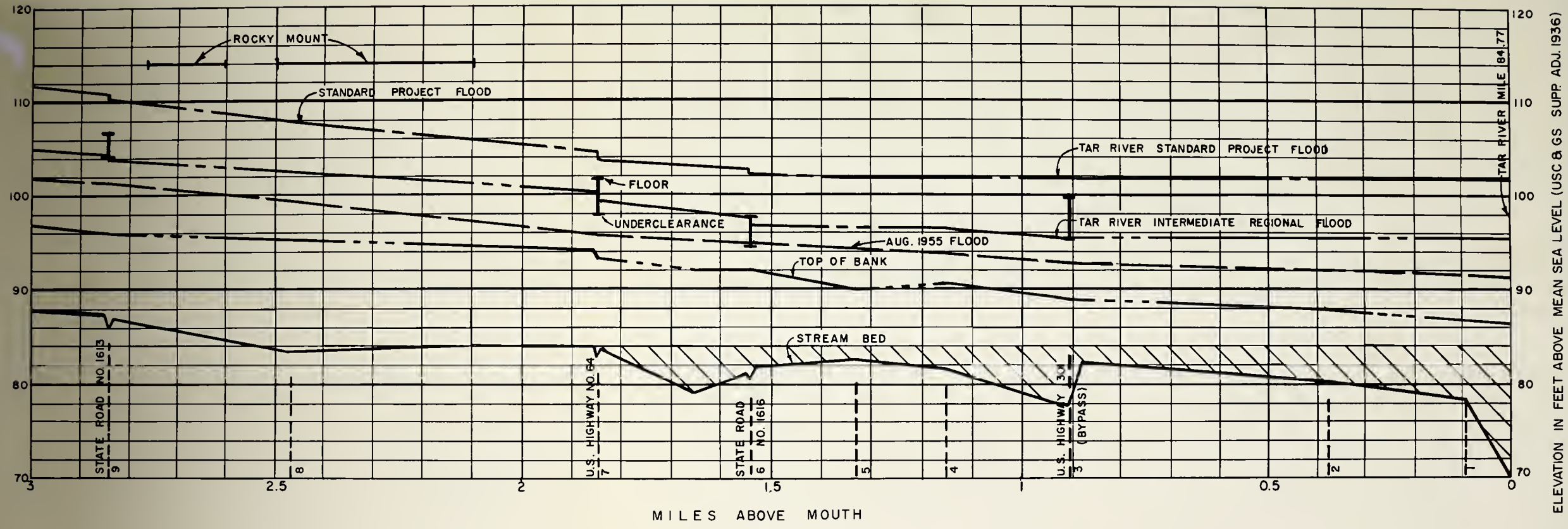
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

FLOOD PROFILES

TAR RIVER

ROCKY MOUNT, NORTH CAROLINA
AUGUST, 1968

PLATE 15



---7--- CROSS SECTION LOCATION AND NUMBER

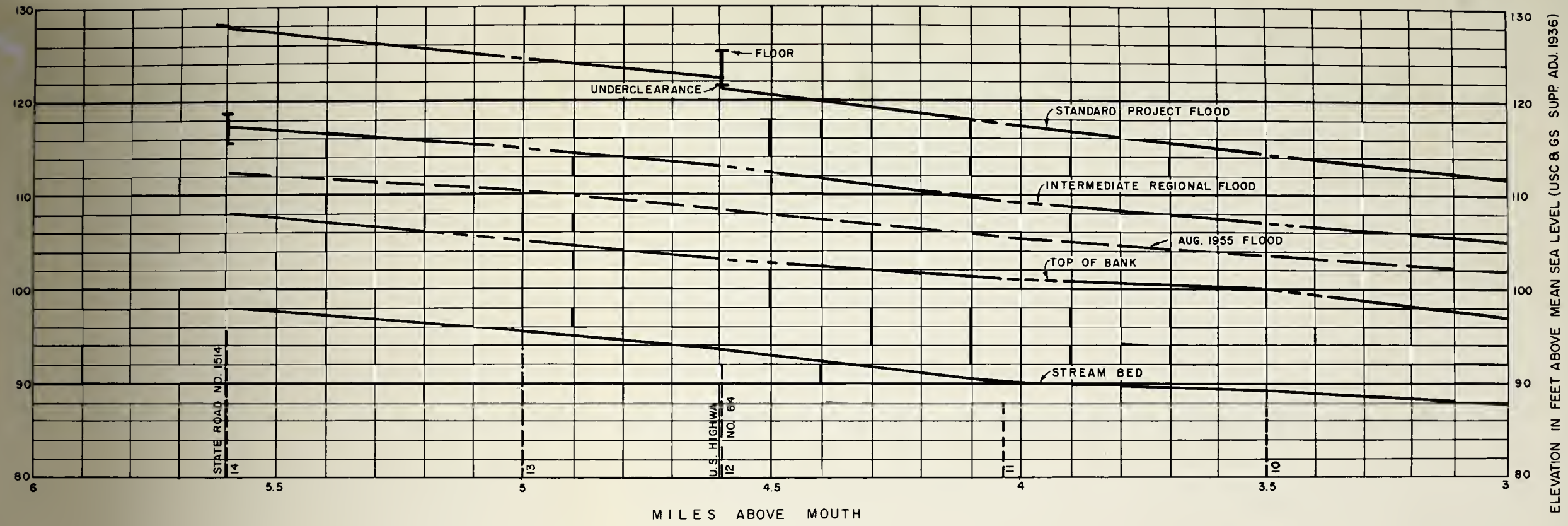
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

FLOOD PROFILES

STONY CREEK

ROCKY MOUNT, NORTH CAROLINA
AUGUST, 1968

PLATE 16



—— 7 —— CROSS SECTION LOCATION AND NUMBER

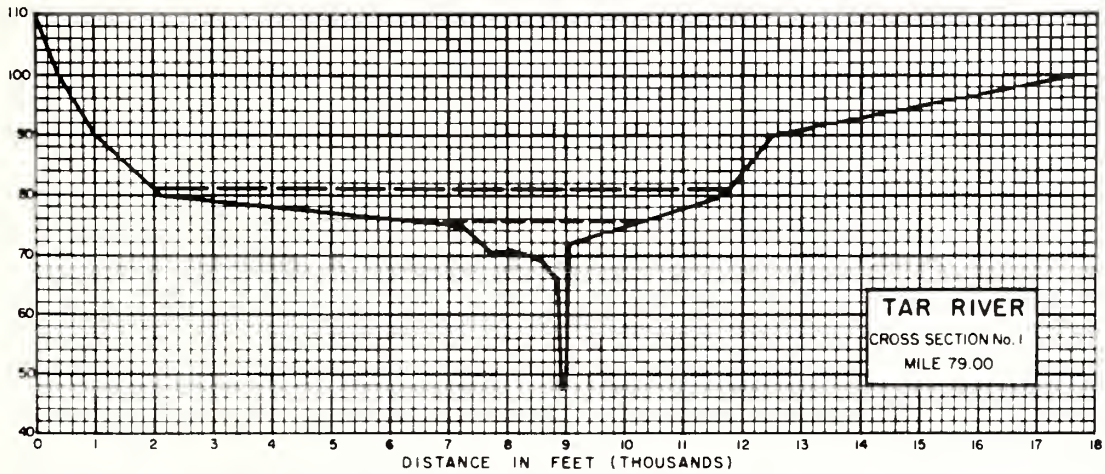
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

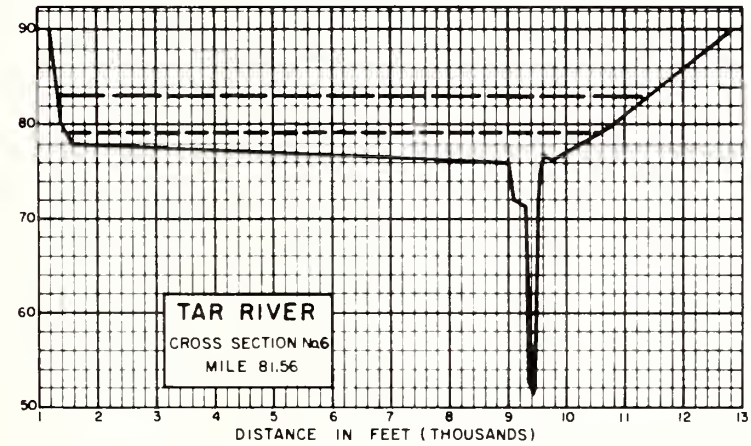
FLOOD PROFILES

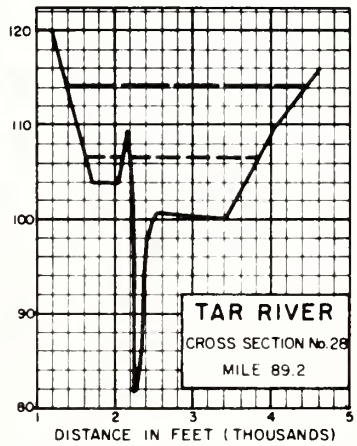
STONY CREEK

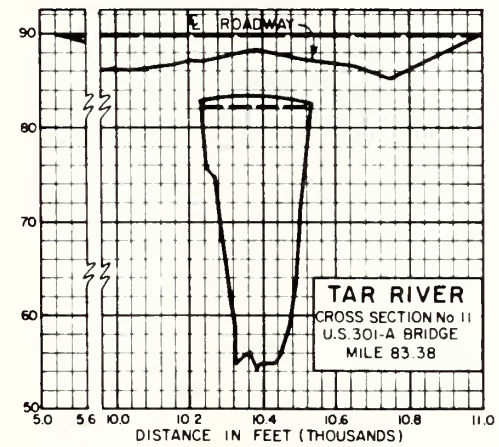
ROCKY MOUNT, NORTH CAROLINA
AUGUST, 1968

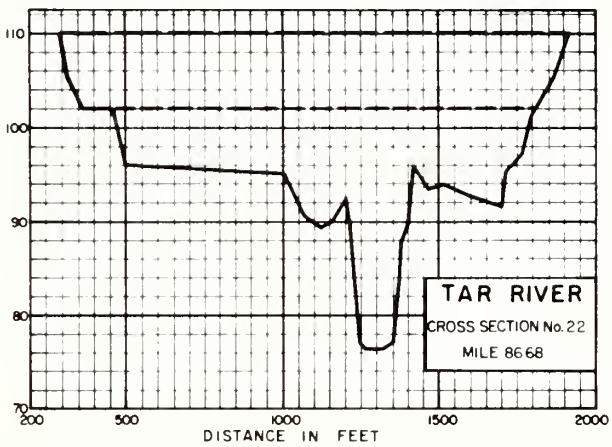
PLATE 17

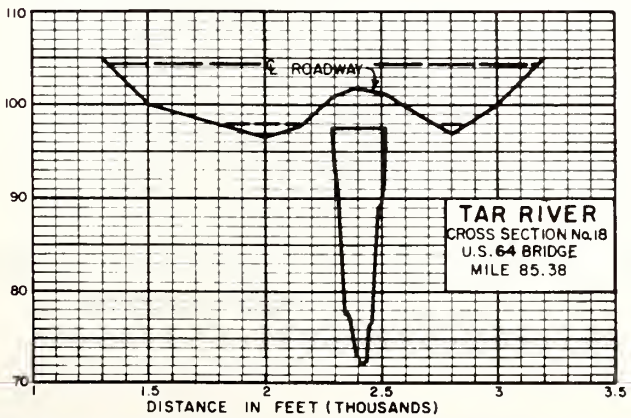












ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (U.S.C.& G.S. SUPPL. ADJ. OF 1936)

STANDARD PROJECT FLOOD

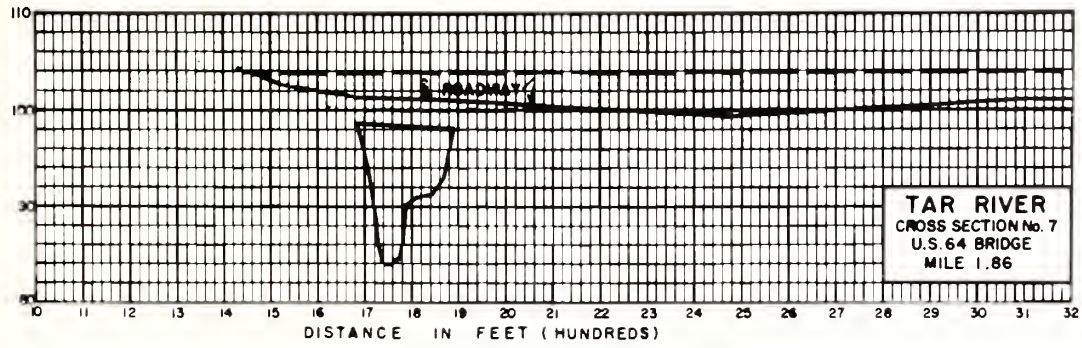
INTERMEDIATE REGIONAL FLOOD

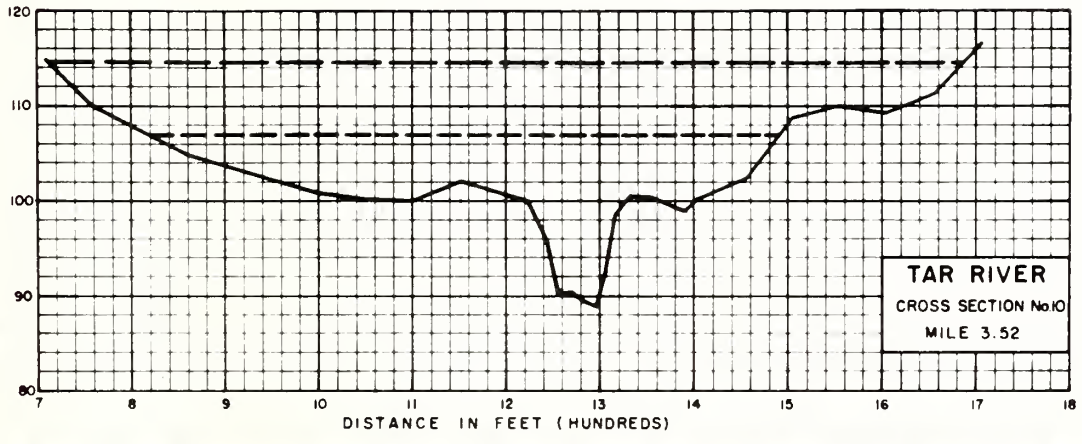
CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON NORTH CAROLINA DISTRICT

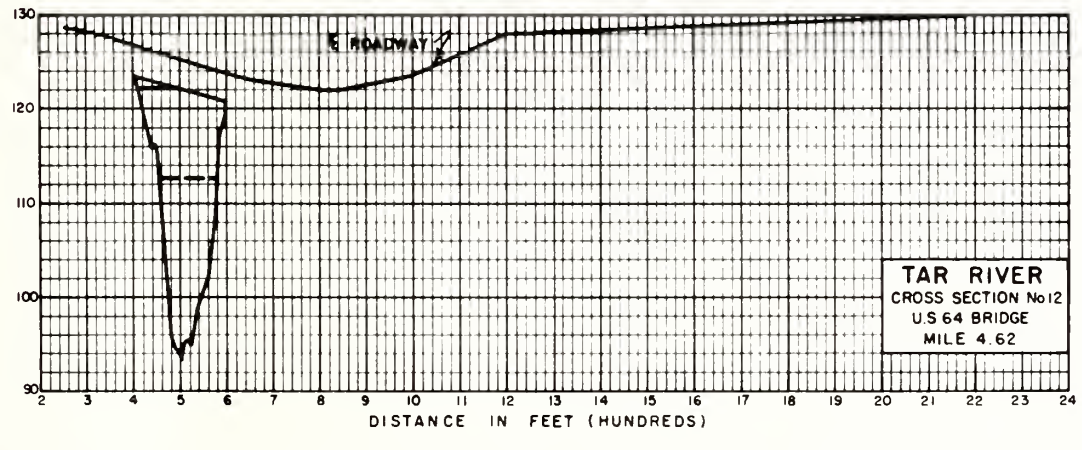
CROSS SECTIONS
TAR RIVER
AT
ROCKY MOUNT, N.C.

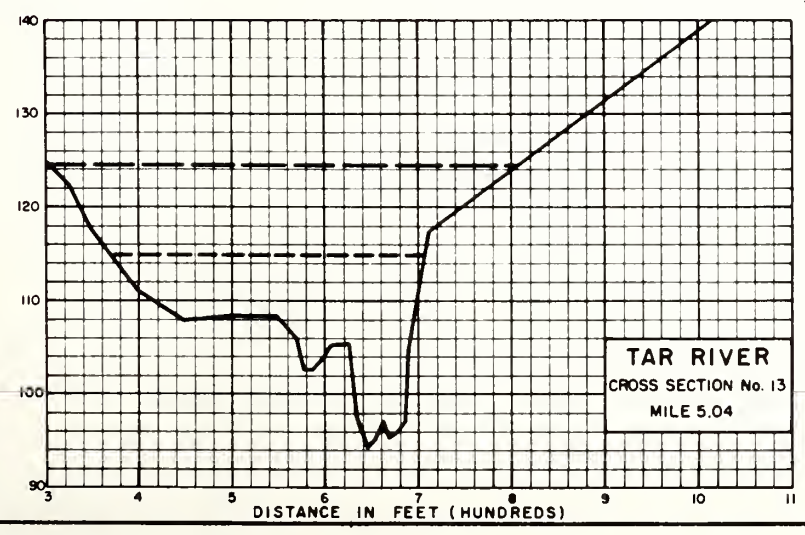
JUNE 1968

PLATE 18









ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (U.S.C.& G.S. SUPPL. ADJ. OF 1936)

STANDARD PROJECT FLOOD.

INTERMEDIATE REGIONAL FLOOD.

CORPS OF ENGINEERS, U. S. ARMY
WILMINGTON, NORTH CAROLINA DISTRICT

CROSS SECTIONS
STONY CREEK
AT
ROCKY MOUNT, N.C.

JUNE 1968

PLATE 19